

# DOCUMENT RESUME

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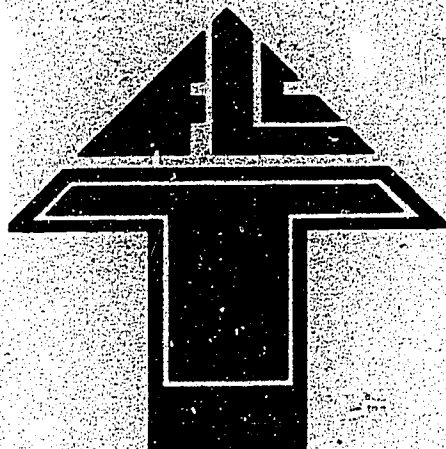
## ABSTRACT

Designed to bridge the communication gap between the Federal Laboratory Consortium (FLC) and public and private sectors of the country, this directory has been prepared as a compilation of scientific and technical research and development activities at federal laboratories, which are directing technology transfer efforts toward increasing the use of their research results by decision makers and operational agencies in the public and private sectors. The directory is organized in three parts: Part I contains a map indicating the various regions of the FLC, an alphabetical listing (by abbreviation) of the member laboratories, a list of participating laboratories/contacts by geographic region, and a list of the CCNTAC (Contacts for Technological Area Coordination) laboratories. An alphabetical listing of FLC laboratories provides quick cross reference for the following sections, and a list of CONTAC Laboratories indicates the primary laboratory that may be contacted for each major application area. Part II is a rundown of the major application areas and the laboratories with expertise in these areas. Information sheets for each laboratory indicate specific scientific and technological areas of expertise and the contact person for that facility. Finally, Part III provides examples of laboratory technology transfer projects in a majority of the scientific and technological activities. (Author/JD)

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**FEDERAL LABORATORY CONSORTIUM**

# **RESOURCE DIRECTORY**

**SEPTEMBER 1978**

**Prepared by the**

**FEDERAL LABORATORY CONSORTIUM  
WITH THE SUPPORT OF THE  
INTERGOVERNMENTAL SCIENCE AND PUBLIC TECHNOLOGY DIVISION  
OF THE  
NATIONAL SCIENCE FOUNDATION**

**NSF-77-047**

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## DISCLAIMER

It is not the intention of the Federal Government, nor the Federal Laboratory Consortium (FLC) to compete with industry in the supply of services to state and local governments. Rather, the Consortium encourages partnerships with industry in solving the problems of state and local governments. It is the intention of the Consortium to make its resources available to industry as well as to state and local governments and Federal agencies. To the extent that these provide new product or services opportunities for industry in either private or public markets, industry is encouraged to avail themselves of the Federal R&D resources. In fact, the effective transfer of Federal technology to state and local governments requires that the technology ultimately be available commercially.

## INTRODUCTION

Our nation is currently facing a multitude of social and economic problems that require immediate solutions if our standard of living is to remain at its present level. The energy crisis, unemployment, high prices, and many other national concerns, which are equally as meaningful in keeping this nation strong, face all levels of government. An over-abundance in some areas and deficiencies in others provides the fuel for continued unrest and uneasiness in the minds of many. This country's overpowering craving for the best of everything has created problems that require immediate solutions. Rapid changes in public needs and private wants have brought about critical intergovernmental issues. The costs associated with solving these issues is extremely high and, in many instances, requires the use of high technology.

Solutions to the nation's many problems must be sought from every available resource; i.e., the federal government, industry and universities. Many solutions can be found through the proper utilization of existing and developing science and technology resources. During the past decade we have invested billions of dollars in research and development (R&D). A significant portion of this R&D was accomplished by the laboratories of the federal government. These laboratories represent a source of technology that, when properly mobilized, could possibly provide the solutions to many of our nation's problems.

There are many reasons which, when combined, provide the rationale for using federal laboratories as a technical resource. One predominates: access to existing technologies, facilities, equipment, etc., for use by state and local governments to help solve the nation's problems represents a greater return on the taxpayer's investment in science and technology through more effective primary and secondary use of R&D results.

State and local governments are aware that many of their problems can only be solved through use of science and technology. However, state and local government agencies cannot afford to invest large sums in R&D and, therefore, it is not a high priority item in their budgets. Federal government laboratories may not have the technology needed by these government agencies to solve all their problems, but substantial public investment in R&D has produced technologies that could, with suitable adaptation, fill important gaps.

If federal technology can increase the productivity of state and local government, industry can also benefit by serving as the continuing commercial supplier to state and local governments.

The federal laboratories are presently accountable to many federal government agencies. There is no formal integrating management system within the federal laboratories to ensure that the technology transfer and utilization process is coordinated and productive. There is, however, an

informal Federal Laboratory Consortium for Technology Transfer which, to date, consists of more than 180 of the largest federal government laboratories and centers from a number of high technology agencies. The Division of Intergovernmental Science and Public Technology of the National Science Foundation and the Naval Weapons Center, China Lake, are providing resources which make possible operation of a Secretariat in support of Consortium activities.

Although there are many definitions of technology transfer within the Federal Laboratory Consortium, technology transfer is generally described as the process by which existing knowledge, facilities, or capabilities developed under federal R&D funding are transferred to fulfill actual or potential public or private needs.

The purpose of the Consortium is to increase the use of these laboratories' unique technical expertise and R&D products toward the solutions of problems facing our government agencies and private industries. This technology transfer program emphasizes person-to-person communications between the users and suppliers in the civilian sector and the resource people in the federal laboratories. The development of a well-organized information system and the continuous involvement of the users and suppliers in the problem definition and transfer process along with discrete use of linking agents, or technology transfer "brokers", to bridge the communication gap between researchers and users represents the core program activity.

It is planned to update this Resource Directory annually. If recipients do not receive their updates, they should contact:

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## HOW THE FEDERAL LABORATORY CONSORTIUM CAN HELP YOU

Within the Federal Laboratory Consortium, technology transfer is accomplished in a variety of ways. One approach is in the form of performing civilian-oriented R&D work by one of the DoD Consortium laboratories with funding provided by the requesting institution such as federal, state or local government agencies. These R&D projects are directed towards application to civilian problems, but the solutions are based upon earlier research performed for mission-oriented purposes. Thus, the American taxpayer derives double benefit from the military R&D expenditure. Other members of the Consortium, such as DOE or EPA, are chartered and funded to specifically work in the civilian area. Therefore, they are directing their technology transfer efforts toward increasing the use of their research results by decision makers and operational agencies in the public and private sectors.

In addition to performing R&D activities and pushing for greater use of their R&D products, the Consortium transfers its technology in other ways. Consortium representatives assist state and local government agencies in a variety of non-refundable ways, such as serving on scientific advisory boards, acting as consultants to specialized groups (e.g., law enforcement, pollution control agencies or fire prevention committees), providing library services and identifying sources of surplus government equipment.

One major service provided by the Consortium is in the area of brokerage. Because of the nature of these activities, the Consortium representatives are frequently exposed to new technologies developed by private enterprise, state or local governments, or by another federal laboratory. Therefore, these technology transfer coordinators can serve as "technology brokers" by bringing together the individual or agency that has a problem or need with those who have already solved it or who at least are working in the area. This broker service can be especially useful for local governments who are often unaware of the scientific support available in the federal laboratories.

Private industry can also benefit from the Federal Laboratory Consortium. For example, through the acquisition of government patents originating from these laboratories, a private company can produce and sell a product in the commercial marketplace without having to expend funds for basic R&D. Perhaps most frequently, industry can benefit by becoming the continuing supplier of a service, process, or product initially demonstrated as satisfying a need by one or more of the Consortium laboratories.

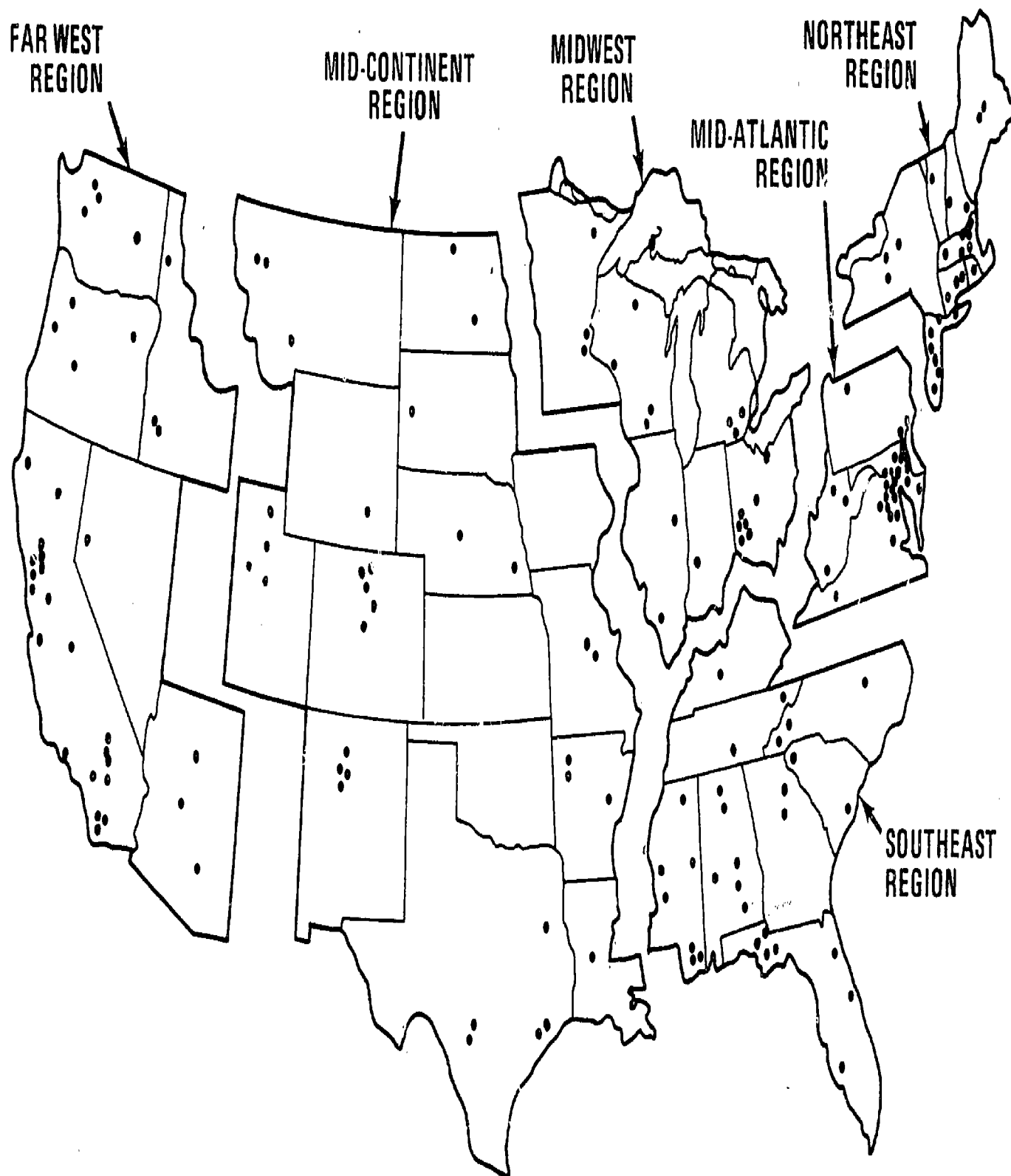
How can the Federal Laboratory Consortium help your city department, county agency, state organization, or federal agency? What assistance can the Consortium give to your Company? It is impossible to say unless there is a person-to-person contact between yourself and a member of the Consortium. The Federal Laboratory Consortium believes that greater utilization of the federal R&D dollar must be realized. This can be done by sharing the existing technology of the federal laboratories and the expertise of the Consortium representatives.

You may contact the Consortium laboratory representative nearest to you or contact the permanent Washington representative located in the Office of Intergovernmental Science and Public Technology, National Science Foundation, who maintains continuing contact with technology transfer in other federal, state or local agencies as well as in private industry and assists in policy development relating to matters concerning the Consortium. Write or call the Federal Laboratory Program Manager, Room 1101, National Science Foundation, 1800 "G" Street NW, Washington, D.C. 20550 (Telephone: 202-634-7996).

To bridge the present communication gap between the Consortium and you, a mechanism is required to provide you with information on the resource capability that exists within the federal laboratories. The Federal Laboratory Consortium Resource Directory was designed for this purpose. This directory has been prepared as a compilation of federal laboratory scientific and technological activities as a function of facilities with a selection of typical technology transfer efforts. Future updates will consist of new Consortium members and their addition of scientific and technological activities along with technology transfer program descriptions.

In section I, you will find a map indicating the various regions of the FLC, an alphabetical listing (by abbreviation) of the member laboratories, a list of participating laboratories/contacts by geographic region, and a list of the CONTAC (Contacts for Technological Area Coordination) laboratories. The alphabetical listing of FLC laboratories is provided for quick cross reference with following sections. The CONTAC Laboratories list indicates the primary laboratory that may be contacted for each major application area. Section II is a rundown of the major application areas and those laboratories with expertise in these areas. This is followed by information sheets for each laboratory indicating specific scientific and technological areas of expertise along with the contact person for that facility. The block in the upper right hand corner indicates the laboratory abbreviation and region for easy cross reference with section I. Finally, section III provides examples of laboratory technology transfer projects in the majority of the scientific and technological activities.

# FEDERAL LABORATORY CONSORTIUM





LABORATORY  
ABBREVIATION GUIDE

Organization		Region
Abbreviation	Full Title	
ADPG	U.S. Army Dugway Proving Ground, Dugway, UT	Mid-Continent
AFAPL	U.S. Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, OH	Midwest
AFAL	Air Force Avionics Laboratory, Wright-Patterson AFB, OH	Midwest
AFGL	U.S. Air Force Geophysics Laboratory, Hanscom AFB, Bedford, MA	Northeast
AFML	Air Force Materials Laboratory, Wright-Patterson AFB, OH	Midwest
AFWAL	U.S. Air Force Wright Aeronautical Laboratory, Wright-Patterson AFB, OH	Midwest
AFWL	U.S. Air Force Weapons Laboratory, Kirtland AFB, NM	Mid-Continent
AMD	U.S. Air Force Aerospace Medical Division, Brooks AFB, TX	Mid-Continent
AMMRC	U.S. Army Materials and Mechanics Research Center, Watertown, MA	Northeast
AMRDC	U.S. Army Medical Research and Devel- opment Command, Frederick, MD	Mid-Atlantic
ARC	Ames Research Center, Moffett Field, CA	Far West
ARRADCOM	U.S. Army Armament Research and Devel- opment Command, Dover, NJ	Northeast
BIFC	U.S. Forest Service, Boise Interagency Fire Center, Boise, ID	Far West
BNL	Brookhaven National Laboratory, Upton, NY	Northeast

Organization		Region
Abbreviation	Full Title	
CEC	U.S. Air Force Civil Engineering Center, Tyndall AFB, FL	Southeast
CEEDO	Air Force Civil and Environmental Engineering Development Office, Tyndall AFB, FL	Southeast
CEL	Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, CA	Far West
CERL	U.S. Army Construction Engineering Research Laboratory, Champaign, IL	Midwest
CGRDC	U.S. Coast Guard Research and Development Center, Avery Point, CT	Northeast
CRL	U.S. Air Force Cambridge Research Laboratory, Cambridge, MA	Northeast
CRREL	U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH	Northeast
CSL	Chemical Systems Laboratory, Aberdeen Proving Ground, MD	Mid-Atlantic
ECL	U.S. Army Electronic Command Laboratories, Fort Monmouth, NJ	Northeast
ERL	Environmental Research Laboratory, Narragansett, RI	Northeast
ETL	U.S. Army Engineer Topographic Laboratories, Fort Belvoir, VA	Mid-Atlantic
FBI	Federal Bureau of Investigation Laboratory, Washington, D.C.	Mid-Atlantic
FFL	Forest Fire Laboratory, Riverside, CA	Far West
FHRS	Fairbank Highway Research Station, McLean, VA	Mid-Atlantic
FRC	Hugh L. Dryden Flight Research Center, Edwards, CA	Far West

Organization		Region
Abbreviation	Full Title	
FSR	U.S. Forest Service, Research, Washington, D.C.	Mid-Atlantic
GSFC	Goddard Space Flight Center, Greenbelt, MD	Mid-Atlantic
HDL	Harry Diamond Laboratories, Adelphi, MD	Mid-Atlantic
HEL	U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD	Mid-Atlantic
HRL	U.S. Air Force Human Resources Laboratory, Brooks AFB, TX	Mid-Continent
INT	U.S. Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT	Mid-Continent
ITS	Institute for Telecommunication Sciences, Boulder, CO	Mid-Continent
JPL	Jet Propulsion Laboratory, Pasadena, CA	Far West
JSC	Lyndon B. Johnson Space Center, Houston, TX	Mid-Continent
KSC	Kennedy Space Center, Kennedy Space Center, FL	Southeast
LaRC	Langley Research Center, Hampton, VA	Mid-Atlantic
LASL	University of California Los Alamos Scientific Laboratory, Los Alamos, NM	Mid-Continent
LBL	Lawrence Berkeley Laboratory, Berkeley, CA	Far West
LeRC	Lewis Research Center, Cleveland, OH	Midwest
LLL	Lawrence Livermore Laboratory, Livermore, CA	Far West
MDL	Medical Devices Laboratory, Washington, D.C.	Mid-Atlantic

Organization		Region
Abbreviation	Full Title	
MERADCOM	U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, VA	Mid-Atlantic
MIRADCOM	U.S. Army Missile Research and Development Command, Redstone Arsenal, AL	Mid-Atlantic
MSFC	George C. Marshall Space Flight Center, AL	Southeast
NADC	Naval Air Development Center, Warminster, PA	Mid-Atlantic
NAEC	Naval Air Engineering Center, Lakehurst, NJ	Northeast
NAFEC	National Aviation Facilities Experimental Center, Atlantic City, NJ	Northeast
NBL	Naval Biosciences Laboratory, Oakland, CA	Far West
NBS	National Bureau of Standards, Washington, D.C.	Mid-Atlantic
NC	U.S. Forest Service, North Central Forest Experiment Station, St. Paul, MN	Midwest
NCSL	Naval Coastal Systems Laboratory, Panama City, FL	Southeast
NE	U.S. Forest Service, Northeastern Forest Experiment Station, Broomal, PA	Mid-Atlantic
NEODC	Naval Explosive Ordnance Disposal Center, Indian Head, MD	Mid-Atlantic
NHRC	Naval Health Research Center, San Diego, CA	Far West
NIOSH	National Institute for Occupational Safety and Health Cincinnati, OH	Midwest

Organization		Region
Abbreviation	Full Title	
NOO	U.S. Naval Oceanographic Office, Bay St. Louis, MS	Southeast
NOSC	Naval Ocean Systems Center, San Diego, CA	Far West
NPRDC	Naval Personnel Research and Devel- opment Center, San Diego, CA	Far West
NPS	Naval Postgraduate School, Monterey, CA	Far West
NRDC	U.S. Army Natick Research and Devel- opment Command, Natick, MA	Northeast
NRL	Naval Research Laboratory, Washington, D.C.	Mid-Atlantic
NSRDC	David W. Taylor Naval Ship Research and Development Center, Bethesda, MD	Mid-Atlantic
NSTL	National Space Technology Laboratory, Bay St. Louis, MS	Southeast
NSWC	Naval Surface Weapons Center, White Oak, Silver Spring, MD	Mid-Atlantic
NUSC	Naval Underwater Systems Center, New London, CT	Northeast
NVEOL	U.S. Army Night Vision and Electro- Optics Laboratories Fort Belvoir, VA	Mid-Atlantic
NWC	Naval Weapons Center, China Lake, CA	Far West
NWSC	Naval Weapons Support Center, Crane, IN	Midwest
ORNL	Oak Ridge National Laboratory, Oak Ridge, TN	Southeast
PNW	U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR	Far West

Organization		Region
Abbreviation	Full Title	
PSW	U.S. Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA	Far West
RADC	U.S. Air Force Rome Air Development Center, Griffiss AFB, NY	Northeast
RIBSS	U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA	Mid-Atlantic
RM	U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO	Mid-Continent
RPL	Air Force Rocket Propulsion Laboratory, Edwards, CA	Far West
SE	U.S. Forest Service, Southeastern Forest Experiment Station, Asheville, NC	Southeast
SL	Sandia Laboratories, Albuquerque, NM	Mid-Continent
SO	U.S. Forest Service, Southern Forest Experiment Station, New Orleans, LA	Mid-Continent
TARADCOM	U.S. Army Tank-Automotive Research and Development Command, Warren, MI	Midwest
TSC	Transportation Systems Center, Cambridge, MA	Northeast
USGS	U.S. Geological Survey, Menlo Park, CA	Far West
WES	U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS	Southeast
WFC	Wallops Flight Center, Wallops, VA	Mid-Atlantic

MEMBER LABORATORY REPRESENTATIVES  
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Forest Science Laboratory . . . . . Durham, NH  
Forest Science Laboratory . . . . . Syracuse, NY  
Sugar Maple Laboratory . . . . . Burlington, VT  
Timber Research Laboratory . . . . . Orono, ME

Department of Defense

Air Force

Air Force Geophysics Laboratory. . . . . Hanscom, MA

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Army Research Institute of  
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Army Armament R&D Command. . . . . Dover, NJ  
Army Cold Regions Research and  
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Army Electronics R&D Command . . . . . Fort Monmouth, NJ  
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Research Center . . . . . Watertown, MA  
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Navy

Naval Air Engineering Center . . . . . Lakehurst, NJ  
Naval Underwater Systems Center . . . . . New London, CT  
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Department of Energy

Brookhaven National Laboratory . . . . . Upton, NY



Environmental Protection Agency

Environmental Research Laboratory . . . . . Narragansett, RI

Department of Interior

Fish and Wildlife Service

Atlantic Salmon Investigations. . . . . Orono, ME  
Tunison Laboratory of Fish Nutrition . . . . . Cortland, NY

Department of Transportation

Coast Guard R&D Center . . . . . Groton, CT  
National Aviation Facilities  
    Experimental Center . . . . . Atlantic City, NJ  
Transportation Systems Center . . . . . Cambridge, MA

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Forest Products and Marketing Laboratory . . . . . Princetown, WV  
Forestry Sciences Laboratory . . . . . Blacksburg, VA  
Forestry Sciences Laboratory . . . . . Morgantown, WV  
Forestry Sciences Laboratory . . . . . Warren, PA  
Northeastern Forest and Range  
Experiment Station . . . . . Upper Darby, PA  
Physiology Laboratory . . . . . Beltsville, MD  
Timber and Watershed Laboratory. . . . . Parsons, WV

### Department of Commerce

National Bureau of Standards . . . . . Washington, D.C.

### Department of Defense

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Army Engineer Topographic Laboratory . . . . . Fort Belvoir, VA  
Army Human Engineering Laboratory. . . . . Aberdeen, MD  
Army Institute of Dental Research. . . . . Washington, D.C.  
Army Medical Bioengineering Research . . . . . Frederick, MD  
Army Medical Research Institute of  
Infectious Diseases. . . . . Frederick, MD  
Army Mobility Equipment R&D Command. . . . . Fort Belvoir, VA  
Army Night Vision & Electro-Optics Laboratories. . . . Fort Belvoir, VA  
Army Research Institute for Behavioral and  
Social Sciences. . . . . Alexandria, VA  
Chemical Systems Laboratory. . . . . Aberdeen, MD  
Harry Diamond Laboratory . . . . . Adelphi, MD  
Walter Reed Army Institute Research. . . . . Washington, D.C.

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Naval Air Development Center . . . . . Warminster, PA  
Naval Explosive Ordnance Disposal Center. . . . . Indian Head, MD  
Naval Oceanographic Office . . . . . Washington, D.C.  
Naval Research Laboratory. . . . . Washington, D.C.  
Naval Surface Weapons Center . . . . . White Oak, MD

Health, Education and Welfare

Medical Devices Laboratory . . . . . Silver Spring, MD

Department of Interior

Fish and Wildlife Service

Eastern Fish Disease Laboratory. . . . . Kearneysville, WV  
Migratory Bird and Habitat Research Laboratory . . . . . Laurel, MD  
National Fish and Wildlife Laboratory. . . . . Washington, D.C.  
Patuxent Wildlife Research Center. . . . . Laurel, MD

Department of Justice

Federal Bureau of Investigation. . . . . Washington, D.C.

National Aeronautics and Space Administration (NASA)

Goddard Space Flight Center. . . . . Greenbelt, MD  
Langley Research Center. . . . . Hampton, VA  
Wallops Flight Center. . . . . Wallops, VA

Department of Transportation

Fairbank Highway Research Station. . . . . Washington, D.C.

## SOUTHEAST REGION

### Department of Agriculture

#### Forest Service

Coweeta Hydrologic Laboratory . . . . . Franklin, NC  
Forest Fire Laboratory. . . . . Macon, GA  
Forest Hydrology Laboratory . . . . . Oxford, MS  
Forest Recreation Unit. . . . . Tuskegee, AL  
Forest Resources Laboratory . . . . . Lehigh Acres, FL  
Forest Tree Seed Laboratory . . . . . State College, MS  
Forestry Recreation Unit. . . . . Clemson, SC  
Forestry Sciences Laboratory. . . . . Athens, GA  
Forestry Sciences Laboratory. . . . . Auburn, AL  
Forestry Sciences Laboratory. . . . . Berea, KY  
Forestry Sciences Laboratory. . . . . Charleston, SC  
Forestry Sciences Laboratory. . . . . Marianna, FL  
Forestry Sciences Laboratory. . . . . Research Triangle, NC  
Institute of Forest Genetics and Forest Insect  
and Disease Laboratory. . . . . Gulfport, MS  
Institute of Tropical Forestry. . . . . Pto Piedras, Puerto Rico  
Naval Stores and Timber Product Laboratory. . . . . Olustee, FL  
Silviculture Laboratory . . . . . Sewanee, TN  
Southeastern Forest Experiment Station. . . . . Asheville, NC  
Southern Hardwoods Laboratory . . . . . Stoneville, MS

### Department of Defense

#### Air Force

Air Force Civil Engineering Center. . . . . Tyndall AFB, FL  
Civil and Environmental Engineering  
Development Office. . . . . Tyndall AFB, FL

#### Army

Army Aeromedical Research Laboratory. . . . . Fort Rucker, AL  
Army Engineers Waterways Experiment Station . . . . . Vicksburg, MS  
Army Missile R&D Command. . . . . Redstone Arsenal, AL

#### Navy

Naval Coastal Systems Laboratory . . . . . Panama City, FL

Department of Energy

Oak Ridge National Laboratory. . . . . Oak Ridge, TN

Department of Interior

Fish and Wildlife Service

Southeastern Fish Cultural Laboratory. . . . . Marion, AL  
National Coastal Ecosystems Team. . . . . Bay St. Louis, MS

National Aeronautics and Space Administration (NASA)

George Marshall Space Flight Center. . . . . Marshall SFC, AL  
Kennedy Space Center . . . . . Kennedy SC, FL  
National Space Technology Lab. . . . . Bay St. Louis, MS

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Forest Products Laboratory . . . . .	Madison, WI
Forestry Sciences Laboratory . . . . .	Carbondale, IL
Institute of Forest Genetics . . . . .	Rhineland, WI
North Central Forest Experiment Station . . . . .	St. Paul, MN
Northern Conifers Laboratory . . . . .	Grand Rapids, MN
Northern Hardwoods Laboratory . . . . .	LaCrosse, WI

### Department of Defense

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Air Force Avionics Laboratory . . . . .	Wright-Patterson, OH
Air Force Materials Laboratory . . . . .	Wright-Patterson, OH
Air Force Wright Aeronautical Laboratory . . . . .	Wright-Patterson, OH

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Army Construction Engineering Research Laboratory . . . . .	Champaign, IL
Army Tank-Automotive R&D Command . . . . .	Warren, MI

#### Navy

Naval Weapons Support Center . . . . .	Crane, IN
--	-----------

### Department of Interior

#### Fish and Wildlife Service

Fish Control Laboratory . . . . .	LaCrosse, WI
Great Lakes Fishery Laboratory . . . . .	Ann Arbor, MI
National Fish and Wildlife Health Laboratory . . . . .	Madison, WI
National Power Plant Team . . . . .	Ann Arbor, MI

Health, Education and Welfare

National Institute for Occupational  
Safety and Health. . . . . Cincinnati, OH

National Aeronautics and Space Administration (NASA)

Lewis Research Center. . . . . Cleveland, OH

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Forest Range and Watershed Laboratory . . . . . Laramie, WY  
Forestry Research Laboratory. . . . . Rapid City, SD  
Forestry Science Laboratory . . . . . Albuquerque, NM  
Forestry Science Laboratory . . . . . Bozeman, MT  
Forestry Sciences Laboratory. . . . . Fayetteville, AR  
Forestry Sciences Laboratory. . . . . Logan, UT  
Forestry Sciences Laboratory. . . . . Missoula, MT  
Intermountain Forest and Range  
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### Department of Defense

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Fish-Pesticide Research Laboratory . . . . . Columbia, MO  
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Department of Commerce

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National Aeronautics and Space Administration (NASA)

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### Department of Defense

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Fish and Wildlife Service

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Moffet Field, CA 94035  
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## STANDARDS SCIENCE

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National Bureau of Standards  
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Washington, D.C. 20234  
(301) 941-3814

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Institute for Telecommunication Sciences  
U.S. Department of Commerce  
Boulder, CO 80302  
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Transportation Systems Center  
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Cambridge, MA 02142

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Naval Underwater Systems Center  
New London, CT 06320  
(203) 442-0771 ext. 2908

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Management Practice. . . . .	AMMRC, AFAPL, CERL, NWC, NPRDC, NUSC, NWS, ARRADCOM, HRL
Management Information . . . . .	NOSC, NWS, NRDC, AMMRC, NCSL, AFAPL, CERL, NWC, NUSC, NADC, WES, ARRADCOM, KSC, NPRDC
Personnel Management, Labor Relations and Manpower Studies. . . . .	LBL, NWC, LLL, RIBSS, NUSC, HRL, NADC, NPRDC, NWS
Personnel Selection and Classification . . . . .	HRL
Research Program Administration and Technology Transfer. . . . .	NOSC, NWS, AMMRC, FHRS, MERADCOM, CEC, NE, INT, NC, PNW, FSR, RIBSS, NUSC, HDL, NWS, HRL, NADC, NCSL, AFAPL, CERL, LASL, NWC, SO, RM, SE, CSL, WES, LeRC, AMD, WFC, ARRADCOM, KSC, NPRDC, LaRC, CEEDO, LLL, PSW
General. . . . .	NUSC, ARRADCOM
<u>AERONAUTICS AND AERODYNAMICS</u>	
Aeroballistics . . . . .	SL, NADC, CSL, NWC
Aerodynamics . . . . .	NSRDC, AFAPL, AFWAL, SL, NWC, NWS, NADC, LeRC, LaRC, AFWL
Aeronautics. . . . .	AFWAL, NWC, NADC, LaRC
Aircraft . . . . .	AFWAL, NAFEC, BIFC, NADC, AMD, WFC, NWC, LaRC

<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Airports . . . . .	NAFEC, WES, AMD, WFC
Parachutes and Decelerators. . .	NRDC, AFWAL, SL, NSWC, NADC, NWSC, NWC, LaRC
Avionics . . . . .	AFWAL, AFAL, NAFEC, BIFC, NADC, AMD, KSC, NWC, LaRC
Test Facilities and Equipment. .	FHRS, NSRDC, AFWAL, SL, NWC, NAFEC, NSWC, NADC, WES, LeRC, AMD, KSC, LaRC
General. . . . .	SL, WES, WFC, NWC, LaRC, NAFEC
<u>AGRICULTURE AND FOOD</u>	
Agricultural Chemistry . . . . .	LASL, KSC, NWC
Agricultural Economics . . . . .	NWC
Agricultural Equipment, Facilities, and Operations . .	LASL
Agricultural Resource Surveys. .	KSC
Agronomy, Horticulture, and Plant Pathology. . . . .	KSC
Animal Husbandry and Veterinary Medicine. . . . .	LASL, NBL, NOSC
Fisheries and Aquaculture. . . .	NOSC, NUSC, ORNL
Food Technology. . . . .	NRDC
General. . . . .	NWC
<u>ASTRONOMY AND ASTROPHYSICS</u>	
Astrogeology . . . . .	LASL, LLL, USGS
Astronomy and Celestial Mechanics. . . . .	ETL, LLL
Astrophysics . . . . .	LASL, LLL, NADC, KSC
Cosmic Ray Research. . . . .	LASL, LLL, LBL
General. . . . .	LASL

## APPLICATION AREA

## LABORATORY

### ATMOSPHERIC SCIENCES

Aeronomy . . . . . LLL, LBL, AFWL, KSC, LaRC

Dynamic Meteorology. . . . . SL, LLL, BIFC, KSC, LaRC

Meteorological Data Collection,  
Analysis and Weather  
Forecasting. . . . . LASL, LLL, FFL, BIFC, NADC, WES, WFC,  
KSC, LaRC, AFGL, NWC

Meteorological Instruments and  
Instrument Platforms . . . . . LASL, SL, NWC, LLL, FFL, BIFC, KSC,  
LaRC, ADPG

Monitoring . . . . . HDL, AFGL, USGS, CSL, NWC

Physical Meteorology . . . . . HDL, LASL, SL, LLL, NSWC, AFGL, KSC

Weather Modification . . . . . NWC, LLL, NWSC, LSC

General. . . . . SL, KSC, NWC, ADPG

### BEHAVIOR AND SOCIETY

Education, Law and Humanities. . RIBSS

International Relations. . . . .

Job Training and Career  
Development. . . . . AMMRC, LASL, NPRDC, LLL, RIBSS, HRL,  
NADC, NHRC, NWC, LaRC

Psychology . . . . . NWSC, CERL, NPRDC, RIBSS, NUSC, HRL,  
NADC

Social Concerns. . . . . RIBSS, HRL, NIOSH, NPRDC

General. . . . . HRL

### BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

Biomedical Instrumentation  
and Bioengineering . . . . . HDL, MDL, NCSL, LASL, NOSC, LLL,  
ORNL, NUSC, LBL, AMD, LeRC, KSC, NWC  
LaRC

## APPLICATION AREA

## LABORATORY

Bionics and Artificial Intelligence . . . . .	KSC, NOSC
Human Factors Engineering. . . . .	HEL, LASL, SL, NOSC, NADC, NUSC, KSC, NPRDC, LaRC, ORNL
Life Support Systems . . . . .	NOSC, HDL, NCSL, LASL, NSWC, NADC CSL, KSC, NWC
Prosthetics and Mechanical Organs . . . . .	MDL, LASL, NSWC, AMRDC, LeRC, HDL, KSC
Tissue Preservation and Storage. . . . .	
General. . . . .	LASL, SL, ORNL, HDL, KSC

## BUILDING INDUSTRY TECHNOLOGY

Architectural Design and Environmental Engineering. . . . .	NWSC, CERL, LASL, SL, LLL, NBL, LBL, WES, KSC, NWC, LaRC
Building Equipment, Furnishings and Maintenance. . . . .	CERL, SL, LaRC
Building Standards and Codes . . . . .	NWSC, CEC, CERL, SL, WES, KSC
Construction Management and Techniques . . . . .	NWSC, CEC, CERL, WES, KSC, LaRC
Construction Materials, Components and Equipment . . . . .	CEL, KSC, CERL, MERADCOM, NSRDC
Structural Analyses. . . . .	NWSC, NSRDC, MERADCOM, CEC, CEL, WES, KSC, NWC, LaRC
General. . . . .	SL, WES

## BUSINESS AND ECONOMICS

Banking and Finance. . . . .	
Consumer Affairs . . . . .	

## APPLICATION AREA

## LABORATORY

Domestic Commerce, Marketing  
and Economics. . . . . AMMRC, LLL, LBL

Foreign Industry Development  
and Economics. . . . .

International Commerce,  
Marketing and Economics. . . .

Minority Enterprises . . . . . LeRC

General. . . . . NWC

## CHEMISTRY

Analytical Chemistry . . . . . NOSC, NRDC, AMMRC, MERADCOM, CSL, AFML,  
AFAPL, LASL, SL, ADPG, NWSC, NWC, LLL,  
NBL, ERL, NSWC, FBI, NADC, NRL, CEEDO,  
NIOSH, WES, LeRC, KSC, ORNL

Basic and Synthetic Chemistry. . LASL, LLL, NSWC, CSL, LBL, NWSC, LeRC,  
NWC, LaRC, ORNL

Industrial Chemistry and  
Chemical Process Engineering . LASL, LLL, NSWC, CSL, LBL, NWSC, WES,  
LeRC, NWC, AFML, ORNL

Photo and Radiation Chemistry. . NOSC, NWSC, LASL, SL, LLL, NSWC, NADC,  
LBL, ETL, LeRC, NWC, LaRC, ORNL

Physical and Theoretical  
Chemistry. . . . . NWSC, MERADCOM, LASL, SL, NWC, LLL,  
HDL, NSWC, AFGL, LBL, CSL, WES, LeRC  
KSC, LaRC, NRL, ORNL

Polymer Chemistry. . . . . NOSC, BNL, MERADCOM, SL, NWC, LLL,  
HDL, NSWC, NRL, NADC, WES, LeRC, KSC,  
LaRC, AFML

General. . . . . NADC, CSL, ARRADCOM, NWC

## CIVIL ENGINEERING

Civil Engineering. . . . . MERADCOM, CEC, CERL, CEL, NWSC, CEEDO,  
WES

## APPLICATION AREA

## LABORATORY

Construction Equipment,  
Materials and Supplies . . . . MERADCOM, CEC, CERL, CFL, NWSC, CEEDO,  
WES, NWC

Earthquake Design. . . . . LLL, WES, CEL

Flood Control. . . . . WES

Highway Engineering. . . . . FHRS, CERL, NWSC, WES

Hydraulic Engineering. . . . . WES

Soil and Rock Mechanics. . . . . NWSC, CEC, LASL, SL, CEL, LLL, AFWL,  
CEEDO, WES, KSC, NWC

General. . . . . ETL, LASL

## COMMUNICATION

Common Carrier and Satellite . . NOSC, KSC, NUSC, AFGL, NADC, ITS, LeRC

Communication and Information  
Theory . . . . . LASL, SL, LLL, RIBSS, NUSC, NADC, ITS,  
AMD, KSC, NWC, NOSC, ORNL

Graphics . . . . . WES, SL, NWC, NUSC, NADC, ITS, KSC,  
ORNL

Policies, Regulations and  
Studies. . . . . ITS

Radio and Television  
Equipment. . . . . NWSC, HDL, LASL, NOSC, NWC, LLL, KSC,  
BIFC, ITS

Sociopolitical . . . . . ITS

Verbal . . . . . NUSC, NADC, ITS

General. . . . . RADC, NADC, ITS, TSC

## COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . NOSC, LBL, AFWL, NWSC, BNL, ETL,  
CERL, LASL, LLL, NUSC, NSWC, NADC, WES  
ARRADCOM, KSC, NWC, LaRC, ORNL

APPLICATION AREALABORATORY

Computer Software. . . . .	NOSC, AMMRC, HDL, ETL, NSRDC, MERADCOM, NPRDC, CERL, LASL, SL, NWC, LLL, NAEC, NUSC, NSWC, HRL, NADC, LBL, NWSC, BNL, CSL, WES, ARRADCOM, KSC, LaRC, AFWL, ORNL
Control Systems and Control Theory . . . . .	NOSC, AFWL, NWSC, LASL, NWC, LLL, HDL, NSWC, NADC, LBL, LeRC, ARRADCOM, KSC, LaRC, ORNL
Information Processing Standards. . . . .	CERL, LLL, RIBSS, NAEC, NWSC, WES, LeRC, KSC, NWC, LaRC, ORNL
Information Theory . . . . .	NOSC, LLL, NAEC, NWSC, KSC, LaRC, ORNL
Pattern Recognition and Image Processing . . . . .	NOSC, BNL, NVEOL, ETL, LASL, LLL, SL, NAEC, NUSC, NSWC, CSL, LBL, WES, HDL, KSC, NWC, LaRC, ORNL
General. . . . .	NADC, HDL

DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . .	HDL, NSRDC, MERADCOM, NCSL, NSWC, AFAL, CERL, LASL, NOSC, NWC, NUSC, NADC, WES, KSC, LaRC
Electromagnetic and Acoustic Countermeasures. . . . .	NOSC, NWSC, HDL, NCSL, AFAL, RADC, NUSC, NADC, CSL, WES, KSC, NWC
Infrared and Ultraviolet Detection. . . . .	AFWL, NVEDL, MERADCOM, AFAL, SL, NWC, LLL, NUSC, HDL, NSWC, BIFC, NADC, WES, KSC, LaRC
Magnetic Detection . . . . .	HDL, MERADCOM, NCSL, AFAL, NSWC, NADC, WES, KSC, NWC
Nuclear Explosion Detection. . .	LASL, SL, AFWL, NOSC
Optical Detection. . . . .	NWSC, NVEDL, AFAL, NOSC, NWC, NUSC, NSWC, NADC, ETL, WES, AMD, KSC



<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Personal Detection . . . . .	NOSC, NVEOL, MERADCOM, NCSL, AFAL, SL, RADC, NADC, ETL, WES, HDL, NWC
Radio Frequency Detection. . . .	NWSC, MERADCOM, AFAL, NWC, LLL, NUSC, NADC, KSC
Seismic Detection. . . . .	MERADCOM, NCSL, LASL, SL, LLL, NSWC, USGS, WES, KSC
General. . . . .	HDL, RADC, BIFC, NADC, WES

### ELECTROTECHNOLOGY

Antennas . . . . .	NWSC, MERADCOM, AFAL, LASL, SL, NOSC, NWC, LLL, RADC, NUSC, HDL, NSWC, NADC, LeRC, WFC, KSC, LaRC
Circuits . . . . .	NOSC, NWSC, MERADCOM, AFAL, AFAPL, LASL, AFWL, NWC, LLL, RADC, NUSC, HDL, NSWC, NADC, LeRC, KSC, LaRC, ORNL
Electromechanical Devices. . . .	NOSC, NWSC, MERADCOM, NCSL, AFAL, AFAPL, LASL, LLL, NSWC, NADC, LeRC, WFC, KSC, NWC, LaRC, ORNL
Electron Tubes . . . . .	AFAL, LASL, LLL, NWSC, LeRC, KSC, NWC
Optoelectronic Devices and Systems. . . . .	AFWL, LBL, NWSC, NVEDL, ETL, LASL, NOSC, NWC, LLL, NUSC, HDL, NSWC, NADC, KSC, LaRC, ORNL
Power and Signal Transmission Devices. . . . .	NOSC, NWSC, MERADCOM, AFAPL, LASL, CEL, LLL, RADC, HDL, LeRC, KSC, NWC, LaRC, NSWC, ORNL
Resistive, Capacitive and Inductive Components . . . . .	NWSC, AFAPL, LASL, LLL, HDL, NSWC, LBL, LeRC, KSC
Semiconductor Devices. . . . .	NOSC, NWSC, NVEDL, MERADCOM, AFAPL, LASL, LLL, HDL, NSWC, NRL, LeRC, KSC, NWC, LaRC, ORNL
Telemetry . . . . .	WFC

## APPLICATION AREA

## LABORATORY

General. . . . . NWSC, MERADCOM, TARADCOM, LASL,  
NOSC, RADC, HDL, NRL, NWC, ORNL

### ENERGY

Batteries and Components . . . . HDL, MERADCOM, NWC, LLL, NUSC, NSWC,  
NADC

Electric Power Production. . . . NWSC, MERADCOM, LLL, NADC, NWC, ORNL

Electric Power Transmission. . . NWSC, NSRDC, MERADCOM, CERL, LASL,  
BNL, KSC, ORNL

Energy Sources . . . . . LeRC, AFAPL

Energy Transmission . . . . . LeRC

Energy Use, Supply and  
Demand . . . . . NWSC, LBL, HDL, AFAPL, CERL, LASL,  
NWC, LLL, FSR, ORNL, NSWC, NADC,  
USGS, TSC, KSC

Engine Studies (Energy  
Related) . . . . . NWSC, AMMRC, NSRDC, MERADCOM, LLL,  
AFAPL, LBL, TARADCOM, LASL, NUSC,  
NADC, LeRC, KSC, ORNL

Environmental Studies. . . . . LBL, CERL, LASL, NWC, LLL, NUSC,  
CEEDO, WES, ORNL

Fuel Conversion Processes. . . . NOSC, NWSC, LBL, MERADCOM, CERL,  
LASL, LLL, ORNL, CSL, LeRC, AMD,  
NWC, AFAPL

Fuels. . . . . BNL, NWSC, NSRDC, MERADCOM, AFAPL,  
CEEDO, CEL, NWC, LLL, ORNL, NADC,  
LBL, NRL

Geothermal Energy. . . . . LASL, NWC, LLL, ORNL, ERL, LBL, USGS

Heating and Cooling Systems. . . NOSC, LBL, MERADCOM, TARADCOM, LASL,  
CEL, LLL, KSC, LaRC, ORNL

## APPLICATION AREA

## LABORATORY

Miscellaneous Energy Conversion and Storage. . . . .	MERADCOM, CEC, AFAFL, LASL, CEL, LLL, NUSC, LBL, NSWC, CEEDO, LeRC, KSC, ORNL
Policies, Regulations and Studies. . . . .	LASL, NWC, LLL, LBL, BNL
Selected Studies in Nuclear Technology . . . . .	BNL, LASL, LLL, ORNL, LBL, WES
Solar Energy . . . . .	MERADCOM, CEC, AFAFL, CERL, LASL, NWC, LLL, ORNL, NUSC, CEL, LBL, BNL, NOSC, CEEDO, KSC, LaRC
Reserves . . . . .	LLL, NOSC, ORNL
General. . . . .	CEC, CERL, LASL, LLL, ORNL, NADC, LBL, NWSC, BNL, CEEDO, NWC, LeRC, USGS

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . .	BNL, NWSC, HDL, MERADCOM, CEC, LBL, AFAPL, TARADCOM, CERL, LASL, ADPG, CEEDO, CEL, NWC, LLL, NBL, NAEC, NSWC, AFGL, TSC, CSL, LeRC, AMD, KSC, LaRC, ORNL
Ecological Assesment . . . . .	CEL
Marine Pollution Technology. . .	CGRDC
Noise Pollution and Control. . .	NWSC, HEL, NSRDC, MERADCOM, CEC, TARADCOM, CERL, LASL, NOSC, NUSC, NSWC, CEL, TSC, LeRC, AMD, KSC, NWC, LaRC
Solid Wastes Pollution and Control. . . . .	NWSC, NRDC, NSRDC, CEC, NCSL, CERL, SL, CEL, LLL, FSR, CSL, CEEDO, WES, KSC, NWC, NAEC, ORNL
Water Pollution and Control. . .	NWSC, NRDC, NSRDC, MERADCOM, CEC, NCSL, CERL, NOSC, CEL, NWC, LLL, NBL, ERL, NADC, CSL, LBL, NBL, CLS, CEEDO, WES, ARRADCOM, KSC, LaRC, NAEC, ORNL

## APPLICATION AREA

## LABORATORY

Pesticides Pollution and Control. . . . .	NBL, CSL, WES, KSC
Radiation Pollution and Control. . . . .	NOSC, BNL, LBL, MERADCOM, LASL, SL, LLL, RADC, NSWC, LeRC, KSC, NWC, ORNL
Environmental Health and Safety . . . . .	NWSC, LASL, SL, LLL, NBL, NADC, LBL, AMRDC, WES, LeRC, KSC, NWC, ORNL
Environmental Impact Statement. . . . .	AFWL, LASL, SL, LLL, NBL, ADPG, NWC, CEC, NUSC, CSL, CEEDO, WES, KSC, NWC, CERL, ORNL
General. . . . .	LASL, ADPG, CEL, ARDC, NADC, LBL, CSL, WES, KSC, ORNL

## ENVIRONMENTAL RESOURCE MANAGEMENT

Marsh Creation for Wildlife Habitats . . . . .	WES
Recreation Planning . . . . .	WES
Fisheries Development . . . . .	WES
Water-Quality Evaluation . . . . .	WES
Water-Quality and Ecological Simulation Models . . . . .	WES
Water-Resources Analysis . . . . .	WES
Land Treatment of Wastewater . . . . .	WES

## GOVERNMENT INVENTIONS FOR LICENSING

Biology and Medicine . . . . .	LASL, NOSC, LLL, LBL, BNL, KSC, LaRC, ORNL
Chemistry. . . . .	LLL, NUSC, LBL, ORNL, LaRC
Electrotechnology. . . . .	NOSC, CEL, HDL, KSC, ORNL, LaRC
Food Technology. . . . .	

<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Instruments. . . . .	CEL, LLL, NUSC, HDL, LBL, KSC, LaRC, ORNL
Mechanical Devices and Equipment. . . . .	CEL, NUSC, HDL, NADC, KSC, LaRC, ORNL
Metallurgy . . . . .	LLL, LBL, KSC, ORNL
Nuclear Technology . . . . .	LLL, LBL, ORNL
Optics and Lasers. . . . .	NUSC, KSC, LaRC, ORNL
Ordinance . . . . .	KSC
General. . . . .	MERADCOM, LASL, LeRC, NWC, ORNL

### HEALTH PLANNING

Agency Administration and Financial Management . . . . .	KSC
Community and Population Characteristics. . . . .	LLL, LBL, ORNL
Data and Information Systems. . . . .	KSC, ORNL
Economics and Sociology. . . . .	
Environmental and Occupational Factors. . . . .	SL, LLL, FSR, NADC, LBL, NWSC, NHRC, NIOSH, KSC, NPRDC, ORNL
Health Care Assessment and Quality Assurance. . . . .	AMD, KSC
Health Care Forecasting Methodology. . . . .	
Health Care Delivery Organization and Financial Management . . . . .	
Health Care Measurement Methodology. . . . .	KSC
Health Care Needs and Demands. . . . .	KSC

<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Health Care Utilization. . . . .	
Health Care Technology . . . . .	LLL, LBL, CSL, HDL, KSC, ORNL
Health Delivery Plans, Projects and Studies. . . . .	
Health Education . . . . .	KSC
Health Resources . . . . .	KSC
Health-Related Costs . . . . .	
Legislation and Regulations. . .	MDL
Personal Health Care Services . . . . .	KSC
Planning Methodology . . . . .	KCS
General. . . . .	

INDUSTRIAL AND MECHANICAL  
ENGINEERING

Environmental Engineering. . . .	NWSC, LBL, TARADCOM, CERL, NUSC, NSWC, NADC, WES, KSC, NWC, ORNL
Hydraulic and Pneumatic Equipment. . . . .	MERADCOM, CEL, NADC, NOSC, WES HDL, KSC, NWC
Industrial Safety Engineering. . . . .	MERADCOM, LLL, NADC, KSC, NIOSH, NWC, ORNL
Job Environment. . . . .	NADC, NWSC, NWC
Manufacturing Processes and Materials Handling . . . . .	LASL, LLL, NSWC, LBL, NWSC, LeRC, KSC, NWC, AFML
Nondestructive Testing . . . . .	NOSC, AMMRC, NSRDC, MERADCOM, CEC, ORNL NWSC, CERL, LASL, NWC, LLL, NUSC, AFML, NSWC, NADC, CEEDO, WES, LeRC, KSC, LaRC
Production Planning and Process Controls . . . . .	CERL, LLL, NWSC, KSC, NWC

APPLICATION AREALABORATORY

Plant Design and  
Maintenance. . . . . NWSC, CERL, WES, KSC, NWC

Quality Control and  
Reliability. . . . . NWSC, AMMRC, MERADCOM, LASL, LLL,  
NSWC, LeRC, KSC, NWC

Tooling, Machinery and  
Tools. . . . . MERADCOM, LASL, LLL, NWSC, LeRC,  
KSC, NWC

General. . . . . NAEC, NIOSH, NWC

LIBRARY AND INFORMATION SCIENCE

Environmental Resource Data  
Analysis . . . . . WES

Information Systems. . . . . AMMRC, SL, NWC, LLL, NUSC, NADC, LBL,  
CSL, WES, HDL, LaRC, KSC, ORNL

Marketing and User Services. . . WES, NWC

Operations and Planning. . . . . NOSC, LLL, RADC, WES, LaRC, ORNL

Personnel. . . . . WES

Reference Materials. . . . . NOSC, LLL, NUSC, NADC, LBL, AFWL,  
WES, NWC

General. . . . . NADC, WES, NPRDC, ORNL

MATERIALS SCIENCES

Ablative Materials and  
Ablation . . . . . AMMRC, AFML, LASL, LLL, NAEC, NSWC,  
NWC, LaRC

Adhesives and Sealants . . . . . AMMRC, AFML, LASL, CEL, NWC, LLL,  
NAEC, HDL, NADC, ARRADCOM, NWC, LaRC

Carbon and Graphite. . . . . AFWL, AMMRC, AFML, LASL, LBL, LLL,  
NWC, LaRC, ORNL

Ceramics, Refractories and  
Glass. . . . . AMMRC, NVEDL, MERADCOM, AFML, AFAPL,  
LASL, LLL, NUSC, NSWC, LBL, AFWL, ORNL,  
NWSC, NRL, WES, LeRC, NWC, LaRC, CERL

<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Coatings, Colorants and Finishes . . . . .	NVEDL, MERADCOM, AFML, LASL, CEL, LLL, NADC, NSWSC, WES, NWC, LaRC, CERL, ORNL
Composite Materials. . . . .	AFWL, AMMRC, NSRDC, MERADCOM, AFAPL, LASL, LLL, NAEC, NSWSC, AFML, NADC, WES, LeRC, NWC, LaRC, CERL
Corrosion and Corrosion Inhibition . . . . .	NWSC, AMMRC, MERADCOM, AFML, LASL, LBL, CEL, LLL, NAEC, NSWSC, NADC, CEEDO, WES, LeRC, NWC, LaRC, CERL, ORNL
Elastomers . . . . .	NWSC, AMMRC, MERADCOM, AFML, LASL, LLL, NSWSC, NADC, WES, NWC, LaRC
Fibers and Textiles. . . . .	NRDC, MERADCOM, AFML, LLL, NSWSC, NADC, WES, NWC, FBI
Iron and Iron Alloys . . . . .	AMMRC, NSRDC, AFML, LASL, LLL, NSWSC, NADC, LBL, NSWSC, WES, LeRC, NWC, CERL, ORNL
Lubricants and Hydraulic Fluids . . . . .	NSRDC, MERADCOM, AFML, AFAPL, LLL, NAEC, NSWSC, NADC, NSWSC, LeRC, NWC
Materials Degradation and Fouling. . . . .	AMMRC, NSRDC, MERADCOM, AFML, NSWSC, NADC, WES, CEL, NWC, CERL, NAEC, NSWSC, ORNL
Miscellaneous Materials. . . . .	AFML, LASL, LLL, NSWSC, NADC, WES, NWC
Nondestructive Testing . . . . .	NAEC, NRL, WES, NWC, ORNL
Nonferrous Metals and Alloys . . . . .	AMMRC, NSRDC, AFML, AFAPL, LASL, LLL, NSWSC, LBL, NSWSC, WES, LeRC, NWC, LaRC, CERL, ORNL
Plastics . . . . .	NOSC, AMMRC, AFML, LASL, NWC, LLL, HDL, NSWSC, CEL, NADC, WES, LeRC, ARRADCOM, LaRC, CERL
Refractory Metals and Alloys . . . . .	AMMRC, AFML, LASL, LLL, NSWSC, NADC, LeRC, NWC, ORNL



## APPLICATION AREA

## LABORATORY

Solvents, Cleaners and Abrasives. . . . .	MERADCOM, AFML, LLL, NADC, NWC
Wood and Paper Products. . . . .	MERADCOM, FSR
General. . . . .	LASL, FBI, NADC, NRL, CSL, ARRADCOM, KSC, WES

## MATHEMATICAL SCIENCES

Algebra and Number Theory. . . . .	NOSC, LASL, LLL, LBL, NWSC, LaRC
Analysis (Mathematics) . . . . .	BNL, LASL, NWC, LLL, NSWC, NADC, NOSC, KSC, LaRC, NWSC, ORNL
Geometry . . . . .	LASL, LLL, NSWC, LBL, NOSC
Mathematical Logic . . . . .	BNL, AFWAL, LASL, NWC, LLL, NSWC, NOSC, LaRC, ORNL
Operations Research. . . . .	AFWL, NWSC, NRDC, NCSL, AFWAL, CERL, LASL, LBL, NOSC, NWC, LLL, NUSC, HDL, NSWC, NADC, WES, KSC, NPRDC
Statistical Analysis . . . . .	NOSC, BNL, LBL, AFWAL, CERL, LASL, NWC, LLL, NSWC, NADC, CSL, KSC, NPRDC, NWSC, LaRC, ORNL
Systems Analysis . . . . .	CSL
General. . . . .	BNL, ETL, AFWAL, LASL, LLL, NUSC, LBL, NWC, ARRADCOM

## MEDICINE AND BIOLOGY

Anatomy. . . . .	NOSC, AMD, ORNL
Biochemistry . . . . .	NOSC, LASL, LLL, NBL, NADC, CSL, LBL, NHRC, ORNL
Botany . . . . .	FSR, CSL, ETL, WES, ORNL
Clinical Chemistry . . . . .	MDL, LBL
Clinical Medicine. . . . .	CSL, LBL, AMD

<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Cytology, Genetics and Molecular Biology. . . . .	LASL, LLL, NADC, LBL
Dentistry. . . . .	AMRDC
Ecology. . . . .	SL, ADPG, LLL, FSR, CSL, LBL, NOSC, WES, ORNL
Electrophysiology. . . . .	MDL, LBL, NOSC
Hematology . . . . .	MDL, AMRDC, ORNL
Immunology . . . . .	MDL, LASL, NBL, FBI
Microbiology . . . . .	NWSC, NRDC, MDL, SL, ADPG, LLL, NBL, ORNL
Nutrition. . . . .	NRDC, NOSC
Occupation/Physical Therapy and Rehabilitation . . . . .	NHRC
Parasitology . . . . .	
Pathology. . . . .	LBL
Pest Control . . . . .	WES
Pharmacology and Pharmacological Chemistry. . . . .	NBL, CSL
Psychophysiology . . . . .	NADC, NHRC
Physiology . . . . .	NCSL, NADC, CSL, AMD
Psychiatry . . . . .	NHRC
Public Health and Industrial Medicine . . . . .	LASL, NBL, LBL, AMRDC
Radiobiology . . . . .	LASL, LLL, NADC, LBL, BNL, NRL, LeRC AMD, ORNL
Stress Physiology. . . . .	NADC, LBL, NHRC, AMD
Surgery. . . . .	
Toxicology . . . . .	LASL, ADPG, NBL, CSL, NWSC, AMD, NWC, ORNL
Zoology. . . . .	NOSC, WES, ORNL
General. . . . .	BNL, NIOSH, ARRADCOM, KSC, ORNL

APPLICATION AREALABORATORYNATURAL RESOURCES AND EARTH SCIENCES

Cartography. . . . . ETL, LBL, USGS

Forestry . . . . . NWSC, CEC, FFL, SO, RM, SE, NE, INT, NC, PNW, PSW, FSR, BIFC, CEEDO, ORNL

Geology and Geophysics . . . . . AFWL, LASL, SL, LLL, AFGL, LBL, USGS, WES, KSC, ORNL

Hydrology and Limnology. . . . . LLL, USGS, WES, ORNL

Mineral Industries . . . . . LASL, LLL, FSR, USGS

Natural Resource Management. . . . . CEC, FSR, NWSC, CEEDO, ORNL

Natural Resource Surveys . . . . . CERL, LASL, LLI, FSR, AFGL, USGS, LeRC, ORNL

Snow, Ice and Permafrost . . . . . NSWG, WES, LeRC, CEL

Soil Sciences. . . . . AFGL, AFWL, WES, NWC

General. . . . . ETL, LASL, WES, ORNL

NAVIGATION, GUIDANCE AND CONTROL

Control Devices and Equipment. . . . . NOSC, AFWL, NSWG, AFAL, LASL, SL, NWC, NUSC, NADC, KSC, LaRC

Guidance Systems . . . . . NOSC, NWSC, AFAL, NWC, NUSC, NSWG, NADC, KSC, LaRC

Marine Navigation Technology . . . . . CGRDC

Navigation and Guidance System Components . . . . . NOSC, NWC, NSWG, NADC, NWSC, ETL, LaRC, KSC

Navigation Systems . . . . . NWSC, ETL, NCSL, AFAL, NUSC, NSWG, NADC, WES, KSC, LaRC

General. . . . . AFA, TSC, NWC, LaRCL

NUCLEAR SCIENCE AND TECHNOLOGY

Fusion Devices (Thermonuclear). . . . . LASL, ORNL, LBL, LaRC

Isotopes . . . . . LASL, LLL, NSWG, NADC, LBL, AMD, ORNL

APPLICATION AREALABORATORY

Nuclear Auxiliary Power Systems. . . . .	AFWL, AFAPL, LASL, LLL, NSWC, LaRC
Nuclear Explosions and Devices. . . . .	AFWL, NWSC, LASL, CEL, NSWC, WES, ORNL
Nuclear Instrumentation. . . . .	NOSC, BNL, AFWL, LASL, LLL, ORNL, HDL, NSWC, LBL, WES
Radiation Shielding, Protection and Safety . . . . .	NOSC, AFWL, LASL, LLL, NSWC, LBL, WES, ORNL
Radioactive Wastes and Radioactivity. . . . .	NOSC, LASL, LLL, BNL, WES, ORNL
Reactor Engineering and Nuclear Power Plants . . . . .	AFWL, LASL, LLL, ORNL, NSWC
Reactor Fuels and Fuel Processing . . . . .	LASL, LLL, ORNL
Reactor Materials. . . . .	LASL, LLL, ORNL
Reactor Physics. . . . .	AFAPL, LASL, LLL, NSWC, AFWL, ORNL
General. . . . .	LASL, BNL, KSC, ORNL

OCEAN TECHNOLOGY AND ENGINEERING

Biological Oceanography. . . . .	NBL, NUSC, LBL, NOSC
Domestic and Polar Ice Technology . . . . .	CGRDC
Dynamic Oceanography . . . . .	LASL, NUSC, NOSC, WES, WFC
Effects of Ocean-Dumping of Dredged Material . . . . .	WES
Hydrography. . . . .	NOO, WES
Marine Engineering . . . . .	NOO, NSRDC, NUSC, NOSC, WES
Marine Fire and Safety Research . . . . .	CGRDC
Marine Geophysics and Geology. . . . .	CEL, NADC, NOSC, USGS, NOO, WES, NWC

APPLICATION AREALABORATORY

Oceanographic Vessels,  
Instruments and Platforms. . . NOO, CEL, NUSC, NADC, NOSC, KSC, NWC,  
LaRC

Physical and Chemical  
Oceanography . . . . . SL, CEL, NUSC, NADC, NOSC, WES

Search and Rescue Technology . . CGRDC

Underwater Construction and  
Habitats . . . . . CEL, NOSC, WES

General. . . . . LBL

ORDNANCE

Ammunition, Explosives and  
Pyrotechnics . . . . . AFWL, NWSC, AMMRC, LASL, SL, ADPG,  
NSWC, CSL, ARRADCOM, KSC, NWC

Armor. . . . . AMMRC, LASL, NWC, CSL, NSWC, WES

Bombs. . . . . NWSC, LASL, SL, NWC, NSWC, ARDC, WES

Combat Vehicles. . . . . NWSC, WES, NWC

Detonations, Explosion Effects  
and Ballistics . . . . . AFWL, NWSC, AMMRC, LASL, SL, CEL,  
NWC, NSWC, CSL, WES, ARRADCOM, KSC

Fire Control and Bombing  
Systems. . . . . NWSC, SL, NWC, NSWC, NADC, NOSC,  
ARRADCOM

Guns . . . . . NSWC, ARDC, NWSC, NWC

Rockets. . . . . LASL, NSWC, WFC, NWC

Underwater Ordnance. . . . . LASL, NUSC, NSWC, NWSC, NOSC, NWC

General. . . . . LASL, NSWC, NWC

PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . . NOSC, AMMRC, ETL, AFAL, AFAPL, NADC,  
LASL, SL, NWC, LLL, NUSC, NSWC, LeRC,  
KSC, NWC

APPLICATION AREALABORATORY

Photographic Techniques and  
Equipment. . . . . NWSC, NVEDL, ETL, AFAL, LASL, SL, AFWL,  
ADPG, LLL, NUSC, NSWC, NADC, WES, LeRC,  
KSC

Recording Devices. . . . . NOSC, NWSC, NVEDL, ETL, AFAL, LASL,  
LLL, NUSC, NADC, WES, KSC

General. . . . . NSWC, NADC, KSC

PHYSICS

Acoustics. . . . . NOSC, NWSC, AFWL, MERADCOM, AFAL,  
CERL, LASL, SL, LLL, NUSC, NSWC,  
NADC, WES, LeRC, KSC, NWC, LaRC

Fluid Mechanics. . . . . NOSC, AFWL, AFML, AFAPL, LASL, SL,  
LLL, NUSC, HDL, NSWC, NADC, WES,  
LeRC, LaRC

Optics and Lasers. . . . . NWSC, AMMRC, NVEDL, AFAL, AFAPL, SL, AFWL,  
LASL, NWC, LLL, NUSC, HDL, NSWC, AFGL,  
NADC, NRL, WES, LeRC, AMD, KSC, LaRC, NOSC,  
ORNL

Solid State Physics. . . . . NOSC, AMMRC, NVEDL, AFAL, AFAPL, SL,  
LASL, NWC, LLL, HDL, NSWC, NADC, LBL,  
NRL, LeRC, ARRADCOM, LaRC, ORNL

Structural Mechanics . . . . . NOSC, NWSC, AMMRC, MERADCOM, AFWAL,  
NADC, AFAPL, CERL, SL, NWC, LLL,  
NUSC, NRL, WES, LeRC, CEL, LaRC, ORNL

Plasma Physics . . . . . AFWL, LBL, AFAL, LASL, SL, LLL, HDL,  
NSWC, NADC, LeRC, LaRC, ORNL

Radio Frequency Waves. . . . . MERADCOM, AFAL, LASL, SL, LL, NUSC,  
HDL, NSWC, AFGL, AMD, KSC, NWC, LaRC

General. . . . . MERADCOM, LASL, SL, HDL, NSWC, LBL,  
BNL, NRL, CSL, ARRADCOM, NWC, LaRC

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Economic and Community  
Development. . . . . CEEDO

Education . . . . . NUSC

<u>APPLICATION AREA</u>	<u>LABORATORY</u>
Energy . . . . .	NOSC, BNL, AMMRC, MERADCOM, CEC, NWC, LLL, NUSC, TSC, CEEDO, LBL, WES, LeRC, KSC, LASL, ORNL, LaRC
Environment. . . . .	NOSC, BNL, MERADCOM, CEC, LASL, SL, ADPG, LLL, NUSC, NSW, CSL, NVEDL, LBL, WES, LeRC, KSC, CEEDO, NBL, ORNL, LaRC
Finance. . . . .	
Forensics (Explosives) . . . . .	ARRADCOM
Human Resources. . . . .	NADC, KSC
Police, Fire and Emergency Service. . . . .	NVEDL, MERADCOM, CEC, LASL, NOS, NWC, LLL, FEL, NUSC, NSW, FBI, BIFC, CEEDO, FFL, KSC, LaRC
Transportation . . . . .	FHRS, MERADCOM, LASL, SL, LLL, TSC, NUSC, KSC
General. . . . .	LASL, NUSC, LBL, KSC, NWC, LaRC, ADPG

#### TRANSPORTATION

Air Transportation . . . . .	BIFC, TSC, CEEDO, WES, HDL, LaRC
Global Navigation Systems. . . . .	NOSC, NADC, TSC, LaRC
Marine Traffic Management . . . . .	CGRDC
Marine and Waterway Transportation . . . . .	NSRDC, MERADCOM, NCSL, TSC, WES, NWC
Metropolitan Rail Transportation . . . . .	LBL, TSC
Offroad Mobility or Transportation . . . . .	WES
Pipeline Transportation. . . . .	HDL, MERADCOM, TSC, KSC
Railroad Transportation. . . . .	MERADCOM, TSC, WES, NWC
Road Transportation. . . . .	LBL, TSC, WES, HDL, NWC, LeRC
Transportation Safety. . . . .	LaRC
General. . . . .	LASL, TSC, NWC, SL

APPLICATION AREA

LABORATORY

URBAN AND REGIONAL TECHNOLOGY AND  
DEVELOPMENT

Communications . . . . .	KSC
Economic Studies . . . . .	CERL, LBL
Emergency Services and Planning . . . . .	LASL, KSC
Environmental Management and Planning . . . . .	NOSC, MERADCOM, CEC, CERL, FSR, CEEDO, WES, KSC
Fire Services, Law Enforcement and Criminal Justice. . . . .	NVEOL, MERADCOM, NUSC, FBI
Health Services. . . . .	KSC
Housing. . . . .	CERL, FSR
Recreation . . . . .	WES
Regional Administration and Planning . . . . .	
Social Services. . . . .	
Transportation and Traffic Planning . . . . .	FHRS, NSWC, TSC, CEEDO
Urban Administration and Planning . . . . .	
General. . . . .	NVEDL



U.S. ARMY DUGWAY PROVING GROUND  
Dugway, Utah 84022

APPLICATION AREA

EXPERTISE

ATMOSPHERIC SCIENCES

Meteorological Instruments and Instrument Platforms . . . . .	Instrumented vans, computer control and data logging, microwave link.
General. . . . .	Sophisticated computer modeling of aerosol transport and diffusion. Fluorescent tracer technology and equipment.

CHEMISTRY

Analytical Chemistry . . . . .	Modern analytical instrumentation. Trace quantity analysis. Capacity for large number of samples. Fate of pesticides in soil, air and water.
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ENVIRONMENTAL POLLUTION  
AND CONTROL

Air Pollution and Control. . . . .	Particulate and gas sampling and analysis. Effects of air pollutants on aerosolized viable particles.
Environmental Impact Assessments and Statements.. . . .	Preparation of assessments. Review of statements.
General. . . . .	R&D on characterizing pollution sources, field sampling, ecological baseline studies. Chambers instrumented and controlled to test devices for pol- lutant emissions.

MEDICINE AND BIOLOGY

Ecology. . . . .	Baseline surveys.
Microbiology . . . . .	Pilot production of cells, sampling of aerosols containing viable bac- teria/virus, capability for analysis of large numbers of samples.

APPLICATION AREA

EXPERTISE

Toxicology . . . . . Animal holding facilities, faunal colony, scientific staff experienced in toxicological determinations.

ORDNANCE

Ammunition, Explosives . . . . . EOD, testing, effects measurement, handling, storage.

PHOTOGRAPHIC AND RECORDING DEVICES

Photographic Techniques and Equipment. . . . . Color/black and white film processing, stills, movies, film reading/data reduction, graphic arts, documentary films, cinetheodolites.

PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Environmental. . . . . Assessment preparation, analysis of environmental effects including field evaluations, ambient monitoring, epidemiology, arbovirology.

General. . . . . Multidisciplined study teams for problem definition.

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U.S. AIR FORCE AVIONICS LABORATORY  
Wright Patterson AFB, Ohio 45433

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>AERONAUTICS AND AERODYNAMICS</u>	
Avionics . . . . .	Solid state electronic device and integrated circuit technology; electro-optic device to provide the basic electronic elements.
<u>DETECTION AND COUNTERMEASURES</u>	
Acoustic Detection . . . . .	Electronic and electro-optic detection, jamming and deception techniques.
Electromagnetic and Acoustic Countermeasures. . . . .	Jamming and deception techniques.
Infrared and Ultraviolet Detection. . . . .	Infrared reconnaissance sensor subsystems. Advanced infrared subsystems for applying ultraviolet technology to current and projected surveillance and intercept operational requirements.
Magnetic Detection . . . . .	Techniques for metal detection.
Optical Detection. . . . .	Electro-optic detection.
Personnel Detection. . . . .	Photographic, electro-optical, infrared and radar reconnaissance sensor systems.
Radio Frequency Detection. . . .	Radar, infrared.
<u>ELECTROTECHNOLOGY</u>	
Antennas . . . . .	Radar reconnaissance sensor subsystems.
Circuits . . . . .	Solid state electronic device and integrated circuit technology.
Electromechanical Devices. . . .	Solid state electronic device; radar and microwave technology; lasers and electro-optic device to provide the basic electronic elements applicable to weapons systems.

## APPLICATION AREA

## EXPERTISE

Electron Tubes . . . . . Electro-optical device.

## NAVIGATION, GUIDANCE AND CONTROL

Control Devices and Equipment. . . . . Control display, aerodynamic stability, handling qualities, control equipment and instrumentation, portable ILS equipment, and use of the pilot as a control element.

Guidance Systems . . . . . Inertial reference and guidance technology.

Navigation Systems . . . . . Flight path control, control displays, portable ILS equipment.

General. . . . . Quick-response solutions to critical Air Force problems.

## PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . . Techniques, materials, and uses of holography and holograms; acoustic holography.

Photographic Techniques and Equipment. . . . . Electronic image evaluator, distortion calibrator/camera.

Recording Devices. . . . . Mann precision comparator and the world's largest optical collimator (100" diameter).

## PHYSICS

Acoustics. . . . . Generation and transmission of sound through various media or enclosures. Includes ultrasonic and infrasonic radiation.

Optics and Lasers. . . . . Generation and propagation of electromagnetic waves on the infrared, visible, and ultraviolet region of the spectrum. Theory, design, and performance of optic equipment. Includes lasers and masers.

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APPLICATION AREA

EXPERTISE

Solid State Physics. . . . . Physical properties of solids as related to their structure. Fundamental research and theoretical studies of semiconductors; band structures of solids. Includes crystallography and superconductivity.

Plasma Physics . . . . . Mathematical, computational, experimental, diagnostics; laser-plasma interactions.

Radio Frequency Waves. . . . . Radar and microwave technology.

CONTACT:

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Autovon: 785-5804

AIR FORCE AERO PROPULSION LABORATORY  
Wright-Patterson AFB, Ohio 45433

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Practice. . . . . Record keeping, planning, scheduling, organization, coordination, decision making, policy making, modernization; cost effectiveness; management analysis.

Management Information . . . . . Performance, budgeting, and accounting, or other techniques used to permit management to establish and direct plans, including the measurement and evaluation of results. Includes planning, programming and budgeting (PPB), PERT, etc.

Research Program Administration and Technology Transfer. . . . . Research management, development planning and forecasting; contract management; internal and external consultation in R&D organizations; identification and communication of research needs and technical problem areas.

AERONAUTICS AND AERODYNAMICS

Aerodynamics . . . . . Operational flight characteristics and problems of aerodynamically configured bodies as they are affected by the dynamics of phenomena relating to boundary layer, drag, laminar and turbulent flow, compressible flow, lift aerodynamic heating, vortex flow, wake, etc. in aerodynamic regimes (see also Physics--Fluid Mechanics; for missile reentry dynamics).

## APPLICATION AREA

## EXPERTISE

### CHEMISTRY

Analytical Chemistry . . . . . Techniques and instrumentation for the separation and analysis of individual compounds or specific groups of compounds, both inorganic and organic. Includes qualitative, volumetric, gravimetric, optical, spectroscopic, electrochemical, ion exchange, chromatographic analysis and methods; treatment of analytic data; forensic chemistry.

### ELECTROTECHNOLOGY

Circuits . . . . . Circuit theory, network analysis, filters, amplifiers, oscillators, logic circuits, printed circuits, electronic modules, commutators, power supply circuits, waveform generators, analog to digital converters, phase locked systems, etc.

Electromechanical Devices. . . . . Electric motors, relays, switches, conductors, etc.

Power and Signal Transmission  
Devices. . . . . Transmission lines, electric wire and cable, waveguides, electric fuses, circuit breakers; electromagnetic and electric filters, etc.

Resistive, Capacitive, and  
Inductive Components . . . . . Resistors, capacitors, inductors, transformers, electromagnets, potentiometers, thermistors, delay lines, transducers, crystal resonators, etc.; includes miscellaneous and basic components.

Semiconductor Devices. . . . . Transistors, semiconductor diodes, integrated circuits, etc.

## APPLICATION AREA

## EXPERTISE

### ENERGY

- Energy Sources . . . . . Fuel resources and trends; new technology affecting supply. Includes coal, petroleum, natural gas, solar energy, refuse, hydrogen, etc.
- Energy Use, Supply and Demand. . . . . Energy consumption and capacity; supply and demand; supply and projections; technological advances and impacts on the industry.
- Power and Heat Generation. . . . . Design and operation of heating and electric power plants and equipment; residential energy production and its environmental aspects; solar cooling and heating.
- Energy Conversion and  
Storage. . . . . Conversion studies not applied to commercial, industrial, or residential use; theory; new technology. Includes nuclear converters, solar cells, heat storage, batteries, fuel cells, magnetohydrodynamics, electric generators, turbogenerators, mechanical conversion, thermoelectric and thermionic conversion, photoelectric and photovoltaic conversion, thermonuclear power.
- Fuel Conversion Processes. . . . . Physical and chemical methods for converting fuels to increase their availability by improving handling, storage, or use. Includes coal liquification and gasification, fuel desulfurization, oil shales conversion, and refineries; new technology.
- Engines and Fuels. . . . . Production, performance, storage, etc. of all types of solid, liquid, or gaseous fuels (except rocket fuels), reciprocating, rotating, jet, and gas turbine engines and components without specific application.



## APPLICATION AREA

## EXPERTISE

### ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control . . . . Air pollution from turbine engine exhausts, sampling and analytical techniques, and equipment; air pollution chemistry; atmospheric motion; laws; public administration; economics.

### MATERIALS SCIENCES

Ceramics, Refractories, and Glass . . . . . Ceramic materials; non-metallic refractory materials; cermets.

Composite Materials . . . . . Materials composed of two or more physically distinct constituents. Includes reinforced plastics, carbon or graphite composites, laminates, metal matrix composites, fiber wound composites, filled composites, particulate composites, etc.

Lubricants and Hydraulic Fluids. . . . . Chemical, mechanical, and physical properties, performance, and production of turbine engine oils, lubricants, and hydraulic fluid additives.

Nonferrous Metals and Alloys. . . Microstructure, physical properties and mechanical properties; phase studies.

### NUCLEAR SCIENCE AND TECHNOLOGY

Nuclear Auxiliary Power Systems . . . . . SNAP technology, both isotropic and reactor.

### PHOTOGRAPHY AND RECORDING DEVICES

Holography. . . . . Techniques, materials, and uses of holography and holograms; acoustic holography.

## APPLICATION AREA

## EXPERTISE

### PHYSICS

- Fluid Mechanics . . . . . Theoretical and experimental studies of the dynamics and statics of fluids and of relative motion between fluids and solid bodies. Includes aerodynamics and hydrodynamics.
- Optics and Lasers . . . . . Generation and propagation of electromagnetic waves on the infrared, visible, and ultraviolet region of the spectrum. Theory, design, and performance of optical equipment.
- Solid State Physics . . . . . Physical properties of solids as related to their structure. Fundamental research and theoretical studies of semiconductors; band structure of solids. Includes crystallography and superconductivity.
- Structural Mechanics. . . . . Dynamics and statics of solid bodies; kinetics, kinematics, shock and vibration, stress analysis.

CONTACT: Leo S. Harootyan Jr.  
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AIR FORCE GEOPHYSICS LABORATORY  
Hanscom Air Force Base  
Bedford, Massachusetts 01731

APPLICATION AREA

EXPERTISE

ATMOSPHERIC SCIENCES

Meteorological Data Collection, Analysis and Weather Forecasting. . . . .	Atmospheric dynamics, densities and winds as measured from satellites, rockets and balloons and remote probing techniques. Expertise in assessing weather and climate at remote locations, in particular as affecting aviation.
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CHEMISTRY

Physical Chemistry . . . . .	Application of physical chemistry techniques such as mass spectrometers and molecular beam apparatus to study chemical reaction rates in the natural atmosphere and stratosphere. Studies of photochemical processes.
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ENVIRONMENTAL POLLUTION  
AND CONTROL

Air Pollution. . . . .	Expertise in contamination of atmos- phere by aircraft exhaust products or fuel dumping.
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NATURAL RESOURCES AND  
EARTH SCIENCES

Natural Resource Surveys . . . . .	Expertise in all phases of geodetics and gravity, both ground based and from aircraft and satellites.
Geology and Geophysics . . . . .	Expertise in seismology and geology, crustal physics.

PHYSICS

Optics and Lasers. . . . .	Expertise in infrared and passive microwave remote sensing, in partic- ular as applied to atmospheric studies.
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APPLICATION AREA

EXPERTISE

Radio Frequency Waves. . . . . Expertise in all aspects of ionospheric physics and electromagnetic propagation through natural aerospace environment and as disturbed by solar flares.

CONTACT: John N. Howard  
Air Force Geophysics Laboratory  
Hanscom Air Force Base  
Bedford, Massachusetts 01731  
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Autovon: 478-3161

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U.S. AIR FORCE MATERIALS LABORATORY  
Wright Patterson AFB, Ohio 45433

APPLICATION AREA

EXPERTISE

CHEMISTRY

- |  |   |
|--|---|
| Analytical Chemistry . . . . .                                       | Chemical ionization mass spectroscopy, high resolution mass spectroscopy, gas chromatography and thermolytic dissociation, emission spectrographic and atomic absorption, gas analyses of metals, wet chemical analysis and X-ray fluorescence. |
| Industrial Chemistry and<br>Chemical Process<br>Engineering. . . . . | Investigate the physical metallurgy of titanium, aluminum, superalloys, refractory metals and alloys.   |
| Polymer Chemistry. . . . .   | Research on the synthesis of polymeric and nonpolymeric, organic and inorganic chemical compounds and research on their characterizations and properties.   |

INDUSTRIAL AND MECHANICAL  
ENGINEERING

- |   |  |
|---|--|
| Manufacturing Processes and<br>Materials Handling . . . . . | Chemical and metallurgical processing, metal and nonmetal fabrication techniques and thermionic and solid state device processing. |
| Nondestructive Testing . . . . .                            | Capability in X-ray, eddy current, ultrasonic, microwave, and optical techniques.  |

MATERIALS SCIENCES

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|--|--|
| Ablative Materials and<br>Ablation . . . . . | Development and characterization of ablative plastics and composites. Ablative, thermochemical and thermostructural behavior of ablative plastics investigated to determine very high temperature materials properties and characteristics including erosion rate, char yield, surface and internal temperatures, gas-solid-liquid residues, compositions and similar characteristics. |
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<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
Adhesives and Sealants . . . . .	Development and characterization of structural adhesives and sealants.
Carbon and Graphite. . . . .	Fuel technology based on graphites and carbonaceous materials.
Ceramics, Refractories, and Glass. . . . .	Research and development for ceramics.
Coatings, Colorants, and Finishes . . . . .	Research and exploratory development for preparing coating materials.
Composite Materials. . . . .	Composite testing based on a closed-loop hydraulic system which can control load or displacement imposed on a specimen.
Corrosion and Corrosion Inhibition . . . . .	Development of special coatings and materials that are abrasion resistant to corrosion and corrosion coatings.
Elastomers . . . . .	Elastomer Materials Facility--conducts syntheses, compounding, processing, fabrication and evaluation of elastomeric and complaint materials, e.g., vulcanized elastomer compounds; analyzing polymers through ultraviolet light and gas; static and dynamic evaluation of elastomeric materials.
Fibers and Textiles. . . . .	Fibrous Materials Facility--research in: flexible fibrous structures and high modulus reinforcing agents; physical and chemical characterization of fibers; weaving and evaluation of woven structures; environmental aging, high temperature reactions of fibers.
Iron and Iron Alloys . . . . .	Metallurgical Facility--research includes the capability for the investigation of deformation, aging diffusion, phase relationships and influence of defect structure on properties of metals and alloys.

## APPLICATION AREA

## EXPERTISE

Lubricants and Hydraulic Fluids . . . . .	Chemical, mechanical and physical properties, performance, and produc- tion of all types of oils, lubricants, and hydraulic fluids; lubricant and hydraulic fluid additives.
Materials Degradation and Fouling. . . . .	Aging, erosion, wear, weathering, de- terioration, decay; effects of radia- tion on materials; biodeterioration, including fungus deterioration; cor- rosion and corrosion inhibition; hushing; embrittlement; exfoliation.
Miscellaneous Materials. . . . .	Leather, fur, refrigerants, straw, petroleum, waxes, etc.
Nonferrous Metals and Alloys . .	Microstructure, physical properties and mechanical properties.
Plastics . . . . .	Development and characterization of new structural plastics and composites, structural adhesives and ablative plastics and composites.
Refractory Metals and Alloys . .	Physical metallurgy of refractory metals and alloys.
Solvents, Cleaners, and Abrasives. . . . .	Abrasive resistant coatings.

## PHYSICS

Fluid Mechanics. . . . .	Theoretical and experimental studies of the dynamics and statics of fluids and of relative motion between fluids and solid bodies. Includes aerody- namics and hydrodynamics.
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### CONTACT:

LT COL Gordon Hermann  
Air Force Materials Laboratory  
ATTN: AFML/NA  
Wright-Paterson AFB, Ohio 45433  
Telephone: (513) 255-4528  
Autovon: 785-4528

U.S. AIR FORCE WRIGHT AERONAUTICAL LABORATORY  
Wright Patterson AFB, Ohio 45433

APPLICATION AREA

EXPERTISE

AERONAUTICS AND AERODYNAMICS

Aerodynamics . . . . .	Aerodynamic stability, flight mechanics, aerothermodynamics, gasdynamics, flight performance; structural materials studies--load bearing materials for wide applications to aerodynamic aircraft and missiles.
Aeronautics. . . . .	Flight control; vehicle dynamics; vehicle subsystems; flight mechanics; structures; prototype.
Aircraft . . . . .	Flight control; flight vehicle prototypes, vertical/short take-off and landing (V/STOL), remotely piloted vehicles; structures--flight loads, atmospheric turbulence, analysis methods, flight load sensors; flight mechanics.
Parachutes and Decelerators. . .	Reentry systems.
Avionics . . . . .	Solid state electronic device and integrated circuit technology; electro-optic device to provide the basic electronic elements.
Test Facilities and Equipment. .	Structures Test Facility; Fifty Megawatt Facility; Sonic Fatigue Facility; Landing Gear Test Facility.

MATHEMATICAL SCIENCES

Mathematical Logic . . . . .	General competence.
Operations Research. . . . .	All-weather landing systems, air cushion landing gear systems, cryogenic coolers, and inlet/nozzle/flight vehicle integration, and flight control system simulation.
Statistical Analysis . . . . .	Concepts, data design criteria, and prediction and analysis techniques.



APPLICATION AREA

EXPERTISE

General. . . . . Stability and control design hand-  
books, computer-based design tech-  
niques, matrix structural analysis  
techniques, flutter prediction  
techniques.

PHYSICS

Structural Mechanics . . . . . Dynamics and statics of solid bodies;  
kinetics, kinematics, shock and vibra-  
tion, stress analysis.

CONTACT: Mr. Rudy Bevins  
U.S. Air Force Wright Aeronautical  
Laboratory  
Wright Patterson AFB, Ohio 45433  
Telephone: (513) 255-2803  
Autovon: 785-2803

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AIR FORCE WEAPONS LABORATORY  
Kirtland AFB, New Mexico 87117.

APPLICATION AREA

EXPERTISE

AERONAUTICS AND AERODYNAMICS

Aerodynamics . . . . . Structures, supersonic flow, unusual aircraft modification, aerodynamic laser cavities.

CIVIL ENGINEERING

Soil and Rock Mechanics. . . . . Ground motion, response to high pressure shock waves, ground shock, soil classification and mechanical characteristics.

COMPUTER, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Computer center operation.

Computer Software. . . . . Programming.

Control Systems and Control Theory . . . . . Precision positioning and tracking system.

DETECTION AND COUNTERMEASURES

Infrared and Ultraviolet Detection. . . . . Infrared measurements, infrared imaging.

Nuclear Explosion Detection. . . Nuclear detection, nuclear detection system, nuclear survey instrumentation, radiological health instrumentation.

ELECTROTECHNOLOGY

Circuits . . . . . Theory, circuit design, printed circuit fabrication.

Electro-optical Devices and Systems. . . . . Detectors, low light level imaging systems, infrared imaging systems, display techniques.

APPLICATION AREA

EXPERTISE

ENVIRONMENTAL POLLUTION AND  
CONTROL

Environmental Impact  
Statements . . . . . Environmental engineering.

LIBRARY AND INFORMATIONAL  
SCIENCES

Reference Materials. . . . . Technical Library.

MATERIALS SCIENCES

Carbon and Graphite. . . . . Carbon phenolics, high temperatures  
graphite.

Ceramics, Refractories and  
Glass. . . . . Optical materials.

Composite Materials. . . . . Reentry vehicle materials.

MATHEMATICAL SCIENCES

Operations Research. . . . . Models, war games, analytical  
evaluations.

NATURAL RESOURCES AND EARTH  
SCIENCES

Soil Science . . . . . Mechanical properties, shock response,  
cratering.

Geology and Geophysics . . . . . Characterization, high pressure re-  
sponse, seismology, seismic survey,  
ground shock spectrum.

NAVIGATION, GUIDANCE AND  
CONTROL

Control Devices and Equipment. . High precision pointing and tracking  
systems.

NUCLEAR SCIENCE AND TECHNOLOGY

Nuclear Auxiliary Power  
System . . . . . Isotope generators, nuclear safety.

AIR FORCE WEAPONS LABORATORY  
Kirtland AFB, New Mexico 87117

APPLICATION AREA

EXPERTISE

AERONAUTICS AND AERODYNAMICS

Aerodynamics . . . . .	Structures, supersonic flow, unusual aircraft modification, aerodynamic laser cavities.
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CIVIL ENGINEERING

Soil and Rock Mechanics. . . . .	Ground motion, response to high pressure shock waves, ground shock, soil classification and mechanical characteristics.
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COMPUTER, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . .	Computer center operation.
Computer Software. . . . .	Programming.
Control Systems and Control Theory . . . . .	Precision positioning and tracking system.

DETECTION AND COUNTERMEASURES

Infrared and Ultraviolet Detection. . . . .	Infrared measurements, infrared imaging.
Nuclear Explosion Detection. . .	Nuclear detection, nuclear detection system, nuclear survey instrumentation, radiological health instrumentation.

ELECTROTECHNOLOGY

Circuits . . . . .	Theory, circuit design, printed circuit fabrication.
Electro-optical Devices and Systems. . . . .	Detectors, low light level imaging systems, infrared imaging systems, display techniques.

APPLICATION AREA

EXPERTISE

ENVIRONMENTAL POLLUTION AND  
CONTROL

Environmental Impact  
Statements . . . . . Environmental engineering.

LIBRARY AND INFORMATIONAL  
SCIENCES

Reference Materials. . . . . Technical Library.

MATERIALS SCIENCES

Carbon and Graphite. . . . . Carbon phenolics, high temp ratures  
graphite.

Ceramics, Refractories and  
Glass. . . . . Optical materials.

Composite Materials. . . . . Reentry vehicle materials.

MATHEMATICAL SCIENCES

Operations Research. . . . . Models, war games, analytical  
evaluations.

NATURAL RESOURCES AND EARTH  
SCIENCES

Soil Science . . . . . Mechanical prop .ties, shock response,  
cratering.

Geology and Geophysics . . . . . Characterization, high pressure re-  
sponse, seismology, seismic survey,  
ground shock spectrum.

NAVIGATION, GUIDANCE AND  
CONTROL

Control Devices and Equipment. . . High precision pointing and tracking  
systems.

NUCLEAR SCIENCE AND TECHNOLOGY

Nuclear Auxiliary Power  
System . . . . . Isotope generators, nuclear safety.

## APPLICATION AREA

## EXPERTISE

Nuclear Explosions and Devices. . . . .	Nuclear weapons, nuclear weapons effects, survivability/vulnerability of Air Force systems.
Nuclear Instrumentation. . . . .	X-ray detectors, EMP detectors, photodetectors, nuclear survey in- strumentation, radiological health instrumentation.
Radiation Shielding, Protection and Safety. . . . .	Radiation shielding codes.
Reactor Engineering and Nuclear Power Plants . . . . .	Reactor safety, neutron transport.
Reactor Physics. . . . .	Reactor safety analysis.

## ORDNANCE

Ammunition, Explosives and Pyrotechnics . . . . .	Detonators, energetics, explosives, air blast simulation techniques, ground shock simulation techniques.
Detonators, Explosion Effects and Ballistics . . . . .	Blast effects, computer simulation of large explosions, ground shock, ground motion.

## PHOTOGRAPHY AND RECORDING DEVICES

Photographic Techniques and Equipment. . . . .	High speed photography, infrared photography, image converter cameras.
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## PHYSICS

Fluid Mechanics. . . . .	Plasma flow, aerodynamic laser cavities.
Optics and Lasers. . . . .	High energy lasers, gas dynamic lasers, electro-dynamic lasers, chemical lasers, large optics.

APPLICATION AREA

EXPERTISE

Plasma Physics . . . . . Hot dense plasma devices, Z pinches  
laser heating, relativistic electron  
beam.

CONTACT:

Dr. Arthur Guenther  
Attention: AFWL/CA  
Air Force Weapons Laboratory  
Kirtland AFB, NM 87117  
Telephone: (505) 264-9856/8561  
Autovon: 964-9856/8561

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USAF AEROSPACE MEDICAL DIVISION  
Brooks AFB, Texas 78235

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ADMINISTRATION</u>	
Research Program Administration and Technology Transfer. . . . .	Research and development management, planning, and forecasting; contract management; in-house laboratories; consultation.
<u>AERONAUTICS AND AERO- DYNAMICS</u>	
Aircraft . . . . .	Noise, vibration, escape systems, environmental control systems wind- screens, survivability/vulnerability, high acceleration cockpit, life support systems.
Airports . . . . .	Noise, land use planning.
Avionics . . . . .	Controls and display, visually coupled systems, heads up display, electro-optic countermeasures.
Test Facilities and Equipment. . . . .	Man-rated dynamic environmental simulator, man-rated centrifuge, man-rated acceleration and deceler- ation impact facility, man-rated climatic chamber.
<u>BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING</u>	
Biomedical Instrumentation and Bioengineering . . . . .	An environmental stress facility capable of various atmospheres; and several altitudes, temperature and decompression chambers. A trace gas analysis laboratory equipped with modern analytical instrumentation for all types of



## APPLICATION AREA

## EXPERTISE

Biomedical Instrumentation  
and Bioengineering  
(contd). . . . .

trace contaminant detection and  
analysis in oxygen and other breathing  
gas systems.

## COMMUNICATION

.Communication and Information  
Theory . . . . .

Operator workload assessment; control-  
ler characteristics for sensor system  
design; visual processes in the per-  
ception of real and displayed infor-  
mation; pattern recognition and infor-  
mation processing by sensory systems.

## DETECTION AND COUNTER- MEASURES

Optical Detection. . . . .

Optically-directed AAA is very effec-  
tive against free world penetration  
aircraft. Requires a viable counter-  
measure to defeat or degrade the  
human visual tracking apparatus.

## ENERGY

Fuel Conversion Processes. . . . .

Toxicology of non-petroleum derived  
jet fuels. .

## ENVIRONMENTAL POLLUTION AND CONTROL

Air pollution and control. . . . .

AMD will develop nationally recognized  
data on chronic inhalation exposure  
effects of volatile Air Force chem-  
icals and recommend occupational ex-  
posure limits (resulting in Air Force  
Occupational Safety and Health  
Standards).

Noise Pollution and  
Control. . . . .

Assess biologic hazards, suggest  
countermeasures, and quantitate acute  
and delayed biologic effects of  
nonionizing laser/maser, nuclear  
flash, radiofrequency, and ionizing  
radiation on man.

## APPLICATION AREA

## EXPERTISE

### HEALTH PLANNING

Health Care Assessment and  
Quality Assurance. . . . . The objective of the USAF Health  
Evaluation and Risk Tabulation  
(HEART) Program is to develop and  
demonstrate in an operational environ-  
ment a prototype system employing  
verified medical techniques for the  
identification of Air Force personnel  
who are at increased risk of develop-  
ing cardio-vascular disease, and sub-  
sequently intervene to reduce that  
risk.

### MEDICINE AND BIOLOGY

Anatomy. . . . . AMD is providing predictions of human  
body response resulting from exposures  
to high level multidirectional impacts  
encountered during ejection, crash,  
ground impact or other short duration  
force inputs to the body. This is  
accomplished by means of a set of  
computer-based bio-dynamic models  
capable of describing human body dynam-  
ics with great detail and accuracy.

Clinical Medicine. . . . . USAF Wilford Hall Medical Center; aero-  
medical consultation service at USAF  
School of Aerospace Medicine.

Physiology . . . . . Advanced oxygen system for new genera-  
tion aircraft; a physiologic demand  
regulator for aircrew breathing gases;  
acceleration protection for aircrews  
of advanced tactical aircraft, anti-  
G mechanical/physiologic systems for  
advanced high performance aircraft.

Radiobiology . . . . . Electromagnetic and particulate radia-  
tion hazards in aerospace operations;  
personnel hazard assessments, safe  
separation distances, and accurate  
predictions of man's ability to maxi-  
mally perform in a laser, radiofre-  
quency, or nuclear radiation environ-  
ment.

## APPLICATION AREA

## EXPERTISE

- Stress Physiology. . . . . Prediction, assessment, and amelioration of the effects of acceleration forces, thermal extremes, and physiologic workloads.
- Toxicology . . . . . Occupational and environmental toxic hazards in Air Force operations; the protection of humans by performing toxicology studies with mammalian laboratory animal species; the assessment of toxic effects in other than mammalian forms of life which are of economic or ecologic importance.

## NUCLEAR SCIENCE AND TECHNOLOGY

- Isotopes . . . . . USAF Radioisotope Committee - established to coordinate the administrative and regulatory aspects of licensing, possession, use storage, handling, and disposal of all radioactive material in the Air Force. Acts as a single point of Air Force contact with the U.S. Nuclear Regulatory Commission on all aspects of radioactive material licensing.

## PHYSICS

- Optics and Lasers. . . . . Safety criteria for developers and users of laser systems; accurately predict hazardous exposure conditions for laser employment; provide performance data and periodic testing of selected laser protective devices and materials in use, and determining the impact of exposure to laser radiation on operational capabilities.
- Radio Frequency Waves. . . . . AMD is working to resolve priority problems on the specific bioeffects of phased array radar emission, peak power pulse effects, chronic versus acute effects, combined stress modification (including multiple frequencies)

APPLICATION AREA

EXPERTISE

Radio Frequency Waves

(Contd). . . . . on RFR permissible exposure levels  
and/or operational systems safety  
criteria.

CONTACT: Mr. Thomas D. N. Douthit  
Air Force Aerospace  
Medical Division  
AMD/RDX  
Brooks AFB, TX 78235  
Telephone: (512) 536-3406  
Autovon: 240-3406

DEPARTMENT OF THE ARMY  
ARMY MATERIALS AND MECHANICS RESEARCH CENTER  
Watertown, Massachusetts 02172

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Practice. . . . . R&D management analysis-SPIDERCHART.  
Management Information  
Systems. . . . . Manufacturing technology M.I.S.  
Research Program Administration  
and Technology Transfer. . . . SPIDERCHART program analysis.

BEHAVIOR AND SOCIETY

Job Training and  
Career Development . . . . . Quality assurance/NDT inspection  
school

BUSINESS AND ECONOMICS

Domestic Commerce, Marketing  
and Economics . . . . . Market analysis/cost driver studies  
of major systems.

CHEMISTRY

Analytical Chemistry . . . . . Wet chemical analysis of materials.

COMPUTERS, CONTROL, AND  
INFORMATION THEORY

Computer Software. . . . . Business analysis, materials analysis,  
mechanics of materials.

ENERGY

Engine Studies  
(Energy Related) . . . . . Ceramic engine development.

INDUSTRIAL AND MECHANICAL

Quality Control and  
Reliability. . . . . QA inspector training program.  
Nondestructive testing. . . . . Basic research/NDT inspection training.

APPLICATION AREA

EXPERTISE

LIBRARY AND INFORMATION SCIENCES

Information Systems . . . . . Manage materials oriented DoD information analysis centers.

MATERIAL SCIENCE

Ablative Materials  
and Ablation . . . . . Research and development.

Adhesive and Sealants . . . . . Research and development.

Carbon and Graphite . . . . . Research and development.

Ceramics Refractories  
and Glass . . . . . Research and development.

Composite Materials . . . . . Research and development.

Corrosion and Corrosion  
Inhibition . . . . . Research and development.

Elastomers . . . . . Research and development.

Iron and Iron Alloys . . . . . Research and development.

Materials Degradation  
and Fouling . . . . . Research and development.

Nonferrous Metals and Alloys . . Research and development.

Plastics . . . . . Research and development.

Refractory Metal and  
Alloys . . . . . Research and development.

ORDNANCE

Ammunition, Explosives  
and Pyrotechnics . . . . . R&D/nuclear ammo development.

Armor . . . . . Research and development.

Detonation Explosion Effects  
and Ballistics . . . . . Ballistic analysis.

APPLICATION AREA

EXPERTISE

PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . . Laser holography for NDT.

PHYSICS

Optics and Lasers. . . . . Laser effects on materials.

Solid State Physics. . . . . Basic research.

Structural Mechanics . . . . . Properties of materials.

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Energy . . . . . Review of heat losses.

CONTACT: R. L. Farrow, Chief  
Technology Transfer Division  
ATTN: Code DRXMR-PT  
Army Materials And Mechanics  
Research Center  
Watertown, Massachusetts 02172  
Telephone: (617) 923-3523  
Autovon: 684-3523

ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND  
Frederick, Maryland 21701

APPLICATION AREA

EXPERTISE

BIOMEDICAL TECHNOLOGY AND  
HUMAN FACTORS ENGINEERING

Prosthetics and Mechanical

Organs . . . . .	Develop material to be used as replacements for tendons, bone segments, arteries, veins.
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ENVIRONMENTAL POLLUTION  
AND CONTROL

Environmental Health

And Safety . . . . .	Establish environmental quality standards for Army-unique contaminants to protect human health; develop effective methods for identification, measurement, control and elimination of contaminants in air and waste water effluents.
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MEDICINE AND BIOLOGY

Dentistry. . . . .	Increase understanding of the causes of oral disease; develop improved dental materials and equipment.
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Hematology . . . . .	Improve the effectiveness of whole blood and blood components and plasma substitutes in blood replacement.
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Public Health and

Infectious Disease Medicine. . . . .	Research in the control of malaria, arthropod-borne virus diseases, diarrhea, hepatitis and acute respiratory diseases.
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CONTACT:

Mr. Lawrence Ware  
Fort Detrick-Bldg. 521  
Frederick, MD 21701  
Telephone: (301) 663-7325  
Autovon: 343-7325



US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND  
Dover, NJ 07801

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Computer Application . . . . .	Systems analysis, data base management, business-type programming.
Management Information . . . . .	Mathematical analysis, management information systems.
Management Practice. . . . .	Corporate planning, programming and budgeting; technical program management, analysis and control; program evaluation.
Research Program Administration and Technology Transfer. . . .	Armament concepts, systems evaluation, programs management, personnel and force development, management information systems, procurement procedures.
General. . . . .	Value engineering, operations research.

CHEMISTRY

General. . . . .	Inorganic, organic, physical, analytical and biological. Environmental technology, CB detection and alarm systems. Experimental and test evaluation, safety and health physics, test facilities.
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COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . .	Large scale, mine, and micro; digital and analog; remote terminals; batch, teletype and graphics; interactive graphics.
Computer Software. . . . .	Scientific and engineering applications, business-type applications, operating systems, weapons control.

## APPLICATION AREA

## EXPERTISE

Control Systems and  
Control Theory . . . . . Information storage and retrieval.

## ENVIRONMENTAL POLLUTION AND CONTROL

Water Pollution Control. . . . . Techniques for monitoring and removing  
organic nitrocompounds, nitramines,  
nitrate esters, sulfites and mineral  
acids occurring in manufacturing  
plant waste streams.

## MATERIALS SCIENCES

Adhesives and Sealants . . . . . Adhesive technology.  
Plastics . . . . . Plastics technology.  
General. . . . . Metallurgy technology.

## MATHEMATICAL SCIENCES

General. . . . . Statistics, simulation, modeling,  
analysis, linear and non-linear  
computer programming.

## MEDICINE AND BIOLOGY

General. . . . . Chemical/biological agents; ecology;  
biology, biochemistry; pollution  
monitoring; environmental assessments;  
demilitarization; human factors.

## ORDNANCE

Ammunition, Explosives and  
Pyrotechnics . . . . . Explosive ordnance disposal, aero-  
ballistics, gun propulsion, energetic  
material, manufacturing technology,  
systems and modeling, fuze technology,  
nuclear and non-nuclear applications  
in ordnance.

Detonations, Explosion Effects  
and Ballistics . . . . . Vulnerability and lethality, ballistic  
modeling, propulsion, launch and  
flight dynamics; terminal effects,  
warhead mechanics, value engineering,  
test facilities.

## APPLICATION AREA

## EXPERTISE

Fire Control and  
Bombing Systems . . . . . Applied science; energetic materials  
and manufacturing technologies; sys-  
tems development modeling; fire con-  
trol systems, simulation and analysis;  
test facilities.

## PHYSICS

Solid State Physics . . . . . Optical absorption, X-ray photoelec-  
tron spectroscopy, scanning electron  
microscopy, electron spin resonance,  
laser Raman spectroscopy applied to  
energetic materials, metals, plastics  
and adhesives.

General . . . . . Mechanical properties, deflagration/  
detonation phenomena, friction and  
electrostatic testing, lasers. Measure-  
ment of electromagnetic field effects -  
RF, lightning, static charge - and  
methods for protection from these  
fields. Classical, solid state, laser,  
semiconductor.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Forensics (Explosives). . . . . Detection and identification of explo-  
sives; handling and chemical and metal-  
lurgical examination of post-explosion  
debris.

CONTACT: T. C. Castorina  
US Army Armament Research and  
Development Command  
Energetic Materials Division  
Dover, NJ 07801  
Telephone (201) 328-2560  
Autovon 880-2560

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**BOISE INTERAGENCY FIRE CENTER**  
**Boise, Idaho 83705**

APPLICATION AREA

EXPERTISE

AERONAUTICS AND AERODYNAMICS

Aircraft . . . . .	Aircraft for surveillance and mapping terrain and wildland fires. Aircraft for tactical fire control.
Avionics . . . . .	Special purpose navigation, direction finder, and communications equipment.

ATMOSPHERIC SCIENCES

Dynamic Meteorology	Application of meteorology to the dynamics of fire weather behavior.
Meteorological Data Collection, Analysis and Weather Forecasting. . . . .	Collection, processing, and transmission of meteorological data from remote sites by satellite relay and telemetry. Area, local, and fire weather forecasting.
Meteorological Instruments and Instrument Platforms . . . . .	Instruments for measuring meteorological parameters in conjunction with remote stations.

COMMUNICATIONS

Radio and Television Equipment. . . . .	Mobile and personal portable radios, repeaters, antennas. Airborne telemetry, radio, TV, and image transmission links.
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DETECTION AND COUNTERMEASURES

Infrared and Ultraviolet Detection. . . . .	Airborne infrared line scanners; terrain and fire detection and mapping; image processing and display; FLIR; portable IR detection equipment.
Lightning Detection. . . . .	Detection and location identification of cloud-to-ground lightning strikes.

APPLICATION AREA

EXPERTISE

NATURAL RESOURCES AND EARTH  
SCIENCES

Forestry . . . . . Forest and wildland fire management, control, and suppression. Infrared surveillance. Field communication systems.

PROBLEM SOLVING FOR STATE AND  
LOCAL GOVERNMENTS

Police, Fire, and Emergency Services . . . . . Complete field communications systems, air transportable to any location. Fire and emergency, logistics, supplies, and management support.

TRANSPORTATION

Air Transportation . . . . . Air transportation of personnel, equipment and supplies for fire and emergency operations.

CONTACT:

John R. Warren  
Electronic Engineer  
USDA-Forest Service  
Boise Interagency Fire Center  
3905 Vista Avenue  
Boise, Idaho 83705  
Telephone: (208) 384-1439  
FTS: 554-1439

BROOKHAVEN NATIONAL LABORATORY  
Upton, New York 11973

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>PHYSICS</u>	
High Energy Physics . . . . .	Theory. Operation of 33 Bev synchrotrons. Hadron spectroscopy. Neutrino interactions. Ultra high vacuum technology. Cryogenics. Electromagnet design. Superconducting 60 Hz power transmission. Advanced proton accelerator design.
Low Energy Physics . . . . .	Theory. Operation of 13 MV Tandem Van de Graaff accelerator.
Solid State Physics . . . . .	Theory. Use of 40 MV uranium-fueled, heavy water moderated reactor. Neutron probe studies of inorganic, organic, and biological structures. Organic conductors.
<u>CHEMISTRY</u> . . . . .	Solar neutrino experiments. Nuclear chemistry: reactions and spectroscopy. Critical point phenomena in changes of state. Structural chemistry using neutron probes. Theory. Transient ions and free radicals. Inorganic solution kinetics and photochemistry. Laser separation of isotopes. Gaseous ion chemistry. Medical radioisotopes. Analysis for environmental pollutants.
<u>BIOLOGY</u> . . . . .	Structural analysis by neutron scattering. Scanning transmission electron microscopy. Fluorescence electron microscopy. Plant genetics and cell biology. Molecular genetics. Photosynthesis.
<u>MEDICINE</u> . . . . .	Nuclear medicine - diagnostic imaging techniques and radiation treatment. Effects of air pollutants - ozone and NOX. Radiation induced carcinogenesis. Hypertension.

APPLICATION AREA

EXPERTISE

ENVIRONMENTAL POLLUTION AND CONTROL

Radiation Pollution and

Control . . . . .

Special competence in radiation-  
related environmental monitoring,  
including long-term effects of  
fall-out effects on human populations.

CONTACT: W. L. Graves  
Brookhaven National Laboratory  
Bldg 460  
Upton, New York 11973  
Telephone: (516) 345-3326  
FTS: 664-3326

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AIR FORCE CIVIL ENGINEERING CENTER  
Tyndall Air Force Base, Florida 32403

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration and Technology Transfer . . .	Program planning, development, execution and management. Contract management. Technology transfer program.
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BUILDING INDUSTRY TECHNOLOGY

Construction Management Techniques . . . . .	Value engineering, network planning, construction management.
Structural Analysis . . . . .	Hardened aircraft shelters and related facilities.
Building Standards and Codes . .	Air Force design criteria and fire protection standards.
Construction Materials, Components and Equipment . . . . .	Aircraft shelters, mobility shelters, community support facilities, housing, mission support facilities.

CIVIL ENGINEERING

Civil Engineering . . . . .	Airfield design and maintenance, sewer plants, water treatment, materials testing.
Construction Equipment, Materials and Supplies . . . . .	Earthmoving, paving, roads and airfields.
Soil and Rock Mechanics . . . . .	Soil stabilization, airfield pavement evaluations.

ENERGY

Solar Energy . . . . .	Solar assisted heat pumps, solar heating and cooling, solar cathodic protection.
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## APPLICATION AREA

## EXPERTISE

Miscellaneous Energy Conversion  
and Storage . . . . .

Wind generators and conversion, alter-  
nate energy for remote sites, solar  
assisted heat for homes.

General . . . . .

Energy conservation techniques. Energy  
monitoring and control systems.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control . . .

Air quality assessment model, aircraft  
engine emissions.

Noise Pollution and Control . .

Noise exposure forecasting for  
airfields.

Solid Wastes Pollution and  
Control . . . . .

Optimum routing, recycling, resource  
recovery.

Water Pollution and Control . .

Electroplating wastes, industrial  
wastes; photo wastes. Water quality  
assessment model.

Environmental Impact  
Assessments . . . . .

Socio-economic, legal, biological,  
terrestrial, air and water, land use,  
planning.

## INDUSTRIAL AND MECHANICAL ENGINEERING

Nondestructive Testing . . . . .

Airfield pavement evaluations, delam-  
inations and water in foam beam,  
honeycomb aluminum panels.

## NATURAL RESOURCES AND EARTH SCIENCES

Natural Resource Management . .

Bird/aircraft strike hazards. Man-  
agement plans for Air Force  
installations.

Forestry . . . . .

Management plans for Air Force  
installations.

APPLICATION AREA

EXPERTISE

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Police, Fire and Emergency Services . . . . .	Structural and crash rescue fire equipment, systems and techniques.
Energy . . . . .	Energy conservation and monitoring and control systems.
Environment . . . . .	Environmental impact assessments, pollution abatement systems, solid waste routing.

URBAN AND REGIONAL TECHNOLOGY  
AND DEVELOPMENT

Environmental Management and Planning . . . . .	Environmental planning, regional recycle and resource recovery.
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AIR FORCE CIVIL AND ENVIRONMENTAL  
ENGINEERING DEVELOPMENT OFFICE  
Tyndall AFB, Florida 32403

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration and Technology Transfer. . . .	Program planning, development, execution and management, contract management. Technology Transfer program.
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CHEMISTRY

Analytical Chemistry . . . . .	Aqueous chemistry, atmospheric photochemistry, pollutant transport mechanisms, advanced pollutant monitoring technique development.
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CIVIL ENGINEERING

Civil Engineering. . . . .	Airfield design and maintenance, water and wastewater treatment.
Construction Equipment, Materials and Supplies . . . .	Paving, road and air field materials.
Soil and Rock Mechanics. . . . .	Soil stabilization, airfield pavement evaluations.

ENERGY

Fuels. . . . .	Conversion of solid waste to energy.
Solar Energy . . . . .	Solar-assisted heat pumps, solar heating, solar cathodic protection.
Miscellaneous Energy Conversion and Storage. . . . .	Wind generators and conversion, alternate energy for remote sites, solar-assisted heat for homes, waste heat recovery.
General. . . . .	Energy conservation techniques, energy monitoring and control systems.
Environmental Studies. . . . .	Environmental chemistry of alternate fuels.

## APPLICATION AREA

## EXPERTISE

### ENVIRONMENTAL POLLUTION AND CONTROL

- Air Pollution and Control. . . . Air quality assessment modeling, aircraft engine emission measurements.
- Solid Wastes Pollution and  
Control. . . . . Optimum routing, recycling, resource recovery.
- Water Pollution and Control. . . Electroplating wastes, industrial wastes, photo waste, water quality assessment modeling, cascade water reuse, pollutant identification.
- Environmental Impact  
Statements . . . . . Environmental engineering.

### INDUSTRIAL AND MECHANICAL ENGINEERING

- Nondestructive Testing . . . . . Airfield pavement evaluations, ultrasonic evaluation of delaminations and water in foam beam, and honeycomb aluminum panels.

### MATERIALS SCIENCES

- Corrosion and Corrosion  
Inhibition . . . . . Cathodic protection, protective coatings.

### NATURAL RESOURCES AND EARTH SCIENCES

- Natural Resource Management. . . Conservation and management plans for Air Force bases and ranges.
- Forestry . . . . . Management plans for Air Force installations.

### PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

- Economic and Community  
Development. . . . . Comprehensive planning.

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## APPLICATION AREA

## EXPERTISE

Police, Fire and Emergency Services . . . . .	Structural and crash rescue fire equipment, systems and techniques. Advanced fire fighting agents, pollution control fire fighting agents.
Energy . . . . .	Energy conservation, monitoring and control systems, conversion of solid waste to energy.
Environment. . . . .	Environmental impact assessments, pollution abatement systems, land use planning.

## TRANSPORTATION

Air Transportation . . . . .	Evaluation of airfield pavement roughness. Evaluation of skid resistance characteristics of airfield pavements techniques to improve skid resistance, warm fog dispersal.
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## URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

Environmental Management and Planning . . . . .	Environmental planning, pollution emission modeling, waste recycle and resource recovery.
Transportation and Traffic Planning . . . . .	Comprehensive planning.

### CONTACT:

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CIVIL ENGINEERING LABORATORY  
 NAVAL CONSTRUCTION BATTALION CENTER  
 Port Hueneme, California 93043

APPLICATION AREA

EXPERTISE

BUILDING INDUSTRY TECHNOLOGY

Structural Analyses. . . . .	Moored, suspended or fixed seafloor structures. Soil liquefaction effects on structures following earthquakes.
Construction Materials, Components, and Equipment. . .	Use of concrete and acrylic plastic in the sea.

CIVIL ENGINEERING

Civil Engineering. . . . .	Sanitary engineering, soil stabilization, water pollution and control, soil and rock mechanics, solid waste pollution and control.
	Structural mechanics, material properties, and load carrying capacity of rigid and flexible airfield pavements.
Construction Equipment, Materials and Supplies . . . .	Automatic leveling controls for excavation and earth moving equipment.
Earthquake Design. . . . .	Techniques for rapid determination of earthquake vulnerability of buildings.
	Predicting and mitigating potential damage effects to structures of seismically induced soil liquefaction.
Soil and Rock Mechanics. . . . .	Physical properties of soil and rock for engineered construction.

ELECTROTECHNOLOGY

Power and Signal Transmission Devices. . . . .	Developed a device to detect and monitor fluctuations in the power supply to sensitive apparatus such as communications equipment and
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## APPLICATION AREA

## EXPERTISE

### Power and Signal Transmission

Devices (contd). . . . . computers. An electrical transient direction detector was also developed that identifies whether the disturbance is caused by the power source or the load.

## ENERGY

Heating and Cooling Systems. . . Investigation of alternate systems to determine suitability for applications.

Fuels. . . . . Investigation of combustion characteristics and suitability of various fuels for use in the boilers and heating plants.

Solar Energy . . . . . Investigation of alternate energy systems to determine economics and suitability for applications.

Miscellaneous Energy Conversion and Storage. . . . . Investigation of alternative techniques to fulfill energy requirements.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Instrumentation and control procedures for emissions from boilers/engine test cells.

Ecological Assessment. . . . . Methods/techniques for ecological inventory, monitoring and evaluation of terrestrial, wet land and aquatic ecosystems.

Noise Pollution and Control. . . . . Materials and analysis techniques for noise control equipment by high sound pressure/temperature.

Solid Wastes Pollution and Control. . . . . Equipment, techniques for recovery/reuse/disposal of solid waste.

Water Pollution and Control. . . . . Improved methods of treating oil spills.

## APPLICATION AREA

## EXPERTISE

Water Pollution and  
Control (contd). . . . . Standards/processes for treatment  
for reuse and disposal of wastewater  
oil spill recovery systems and oil/  
water separator technology.

Systems, hardware and instrumentation  
for dredge spoil reduction by preven-  
tion of deposition around Navy piers.

Toxic substance detoxification/handling  
and land decontamination procedures.  
Process and process control technology  
for heavy metal wastes contaminated  
with sea water.

## GOVERNMENT INVENTIONS FOR LICENSING

Mechanical Devices and  
Equipment. . . . . Propellant driven anchors.

Electrotechnology. . . . . A device to detect and monitor  
fluctuations in power supplies. An  
electrical transient direction detector.

Instruments. . . . . Undersea diver tools.

## INDUSTRY AND MECHANICAL ENGINEERING

Hydraulic and Pneumatic  
Equipment. . . . . Buoyancy Transport Vehicle. Construc-  
tion Assistance Vehicle. Diver tools  
and work systems, ocean cable burial  
and nearshore trenching, deep ocean  
pontoon recovery and salvage systems.

Hydraulic fluidic sensor.

Fluidic mixing device.

Fluidic oil/water separator.



APPLICATION AREA

EXPERTISE

MATERIALS SCIENCES

Adhesives and Sealants . . . . .	Underwater-curing adhesives, and characterization of such materials for construction.
Coatings, Colerants, and Finishes . . . . .	Characterization of such materials for construction, with emphasis on marine and marine atmospheric environments.
Corrosion and Corrosion Inhibition . . . . .	Metal selection for specific end uses, particularly in marine environments, and protective systems for structures exposed to corrosion.
Materials Degradation and Fouling. . . . .	Inspection, repair and maintenance of shore-based facilities; anti-fouling paint and concrete.
Plastics . . . . .	Properties and characteristics related to specific application requirements, e.g., underpier and other piping and utilities, sidings, roofing insulation.

NATURAL RESOURCES AND EARTH  
SCIENCES

Snow, Ice and Permafrost . . . . .	Cold-weather Polar region RDT&E and engineering using in-house developed computer programs, and numerical analytical techniques for solving snow, ice, permafrost and habitation problems. This includes (1) snow handling and processing techniques; (2) analyzing physical and mechanical properties of ice; (3) thermodynamic analysis techniques for predicting heat flux migration in permafrost and ice; and (4) facility and utility system design.
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## APPLICATION AREA

## EXPERTISE

### NUCLEAR SCIENCE AND TECHNOLOGY

#### Nuclear Explosions and

Devices. . . . . Study the damage effects of nuclear explosions operation underwater and above and below ground.

Design hardened air entrainment systems.

Development of blast closure valves.

Development of air blast wave attenuators.

Study alternate power systems for hardened structures.

Design environmental control systems for hardened structures.

### OCEAN TECHNOLOGY AND ENGINEERING

#### Physical and Chemical

Oceanography . . . . . Oil spills.

Marine Geophysics and Geology. . Use of acoustics to determine geological and geotechnical aspects of seafloor.

#### Oceanographic Vessels,

Instruments, and Platforms . . Current measurement systems. Buoyancy Transport Vehicle that performs functions of a seagoing forklift.

Construction Assistance Vehicle--a diver-operated pickup truck.

#### Underwater Construction and

Habitats . . . . . Concrete habitats, acrylic plastic habitats, moorings, cable arrays, load handling systems, diver tools, anchors, underwater mateable electrical connectors, power transmission, distribution and control systems, seafloor excavation and trenching, ocean cable protection.

## APPLICATION AREA

## EXPERTISE

### Underwater Construction and

Habitats (contd). . . . . Design, analysis, construction, and  
emplantment of structures on, in, or  
suspended from the sea-floor, e.g.,  
moorings, cable arrays, breakwaters,  
concrete structures.

Acrylic plastic and concrete for use  
in the ocean. Propellant driven  
anchors; pontoon lift systems for  
salvage work; diver heating systems;  
and undersea diver tools.

Geotechnical investigations. Deter-  
mination of sea-floor and terrestrial  
geotechnical properties. Sea-floor  
penetration and breakout. Anchor  
holding capacity. Sea-floor founda-  
tion design.

## ORDNANCE

### Detonation, Explosion Effects and Ballistics. . . . .

Test and evaluation. Dynamic stru-  
ctural response due to impact loading  
from blast.

## PHYSICS

Structural Mechanics. . . . . Dynamics and statics of solid bodies,  
kinetics, shock and vibration, stress  
analysis (experimental and theoretical).

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Port Hueneme, California 93043  
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Autovon: 360-4070

CONSTRUCTION ENGINEERING RESEARCH LABORATORY  
Champaign, Illinois 61820

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Inventory Control. . . . .	Inventory Control system, Stock level control methods, warehouse automation.
Management Practice. . . . .	Procurement management system, cost analysis, management analysis, effectiveness evaluation of laboratory performance.
Management Information Systems. . . . .	Zero base budgeting, equipment management.
Research Program Administration Technology Transfer. . . . .	Resource data base development, technology transfer program.

BEHAVIOR AND SOCIETY

Psychology . . . . .	Environmental reaction and personnel interactions; job satisfaction; human behavior; adjustment, attitudes; intelligence; judgment, leadership, and motivation; personality, psychology and psychometrics.
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BUILDING INDUSTRY TECHNOLOGY

Architectural Design/ Environmental Engineering. . .	Planning and building program, including functional relationships and building types; market analysis and cost factors; building program; product development and improvement; design methods and problem solving techniques; user needs, user preferences and post-construction evaluation studies; site selection and considerations; aesthetics; ecological factors and sociological, psychological and physiological considerations.
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## APPLICATION AREA

## EXPERTISE

- Construction Management and  
Techniques . . . . . Construction management; the process  
of organizing, planning and control-  
ling the fabrication, delivery and  
erection operations for building,  
using mathematical programming and  
simulation to predict sequences;  
collection of all data related to  
such operations and progress  
accounting; network planning; cost-  
benefit analyses; decision making;  
management systems (PPB etc.); labor-  
management relations; man-power stud-  
ies; record keeping; adverse weather  
practice; logistics planning; simpli-  
fied critical path systems for on-  
site construction planning and control;  
training for construction management;  
site prefabrication.
- Building Standards and Codes . . . U.S. Corps of Engineers guide speci-  
fications in selected fields in  
building construction.
- Construction Materials  
Components and Equipment . . . Includes insulation, moisture-proofing,  
caulking and sealants, furnishings,  
swimming pools, etc.; improved use  
of indigenous materials, simple  
roofing systems; soil comments, rammed  
earth, brick and tile; basic water  
supply and waste systems; plastics;  
structural members, etc.
- Building Equipment, Furnishing  
and Maintenance . . . . . All mechanical systems, power systems,  
interior designs and decors, and  
full range of maintenance activities  
and management.

## CIVIL ENGINEERING

- Highway Engineering. . . . . Construction of roads and highways;  
highway and rights-of-way maintenance,  
bridges and bridge systems.

## APPLICATION AREA

## EXPERTISE

Civil Engineering. . . . . Highway design, sanitary engineering, water supplies, water pollution and control.

Construction Equipment Materials  
and supplies . . . . . Concrete and cement.

## COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Design and development of minicomputers.

Computer Software. . . . . Computer programming, programming languages, large-scale systems of computer applications.

Information Processing  
Standards. . . . . Standards to provide for economic and effective use of automated data processing equipment and systems.

## DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . . Detection by means of sound waves including ultrasonic detection.

## ENERGY

Energy Use Supply and Demand . . . . . Energy consumption and capacity, supply and demand projections, technological advances and impacts on the industry.

Energy Transmission/Electric  
Power Transmission . . . . . Electric power distribution, electric power tools from a wireless energy transmission, new technology and trends.

Fuel Conversion Processes. . . . . Physical and chemical methods of converting fuels to increase their availability by improving handling, storage or use limited to coal liquification and gasification.

Solar Energy . . . . . Design of economic life-cycle cost solar energy heating and cooling system.

## APPLICATION AREA

## EXPERTISE

Environmental Studies. . . . . Impact of energy conversion on the environment.

General. . . . . Economical design of waste derived fuels.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Air pollution from flu gases; control techniques and equipment; sampling and analytical techniques and equipment; waste gas recovery.

Noise Pollution and Control. . . . . Pollution in the environment by noise from any source including engine noise, traffic and transportation noise, industrial noise, urban noise, sonic boom.

Solid Waste Pollution and Control. . . . . Pollution by solid waste including garbage; disposal such as incineration, sanitary landfills; recycling; biological and ecological effects; disposal of concentrated or pure liquids; disposal of pesticides.

Water Pollution and Control. . . . . Pollution by municipal waste, industrial waste; chemistry analysis of pollutants; water pollution; control of techniques and equipment; sewage treatment.

Environmental Impact Statements . . . . . Development of environmental impact of all operations in construction, maintenance, and operations in a small community as represented by a military installation.

## INDUSTRIAL AND MECHANICAL ENGINEERING

Production Planning and Process Controls . . . . . Sampling techniques, modeling techniques and programs controls; operational information.

## APPLICATION AREA

## EXPERTISE

Plant Design and Maintenance . .	Workshops and feasibility studies such as site selection, layout of utilities.
Environmental Engineering. . . .	Design modification and maintenance of equipment and controls of job location.
Nondestructive Testing . . . . .	Ultrasonic testing, radiographic testing, and miscellaneous testing.

## MATERIAL SCIENCES

Ceramic Refractories and Glass. . . . .	Ceramic materials including non-metallic refractory materials.
Coatings, Colorants and Finishes . . . . .	Paints, primers, plastics and rubber coatings, ceramic coatings, etc.
Composite Materials. . . . .	Reinforced plastics, carbonographic composites, laminates, metal matrix composites.
Corrosion and Corrosion Inhibition . . . . .	Corrosion of metals and corrosion inhibition; metal corrosion inhibitors; rusting.
Iron and Iron Alloys . . . . .	Microstructure, physical and mechanical properties; phase studies.
Materials Degradation and Fouling. . . . .	Aging, erosion, wear, weathering, deterioration, decay; biodeterioration; rusting and embrittlement.
Nonferrous Metals and Alloys . .	Microstructure, physical properties, mechanical properties; phase studies.
Plastics . . . . .	Physical and mechanical properties performance and production; includes plastic additives such as plasticizers, stabilizers, fillers, curing agents, etc., filler plastics.



## APPLICATION AREA

## EXPERTISE

### MATHEMATICAL SCIENCES

- Operations Research. . . . . Game theory, cueing theory; management games, mathematical models; mathematical programming, network flow; search theory.
- Statistical Analysis . . . . . Analysis of variance; discriminate analysis; statistical analysis, factual analysis; nonparametric statistics; regression analysis; statistical decision theory; statistical distribution, statistical inference; statistical quality controls; statistical tests.

### NATURAL RESOURCES SURVEYS

- Use of Scientific Satellite  
ERTS . . . . . Aerial photography.

### PHYSICS

- Acoustics. . . . . Generation and transmission of sound through various media or enclosures.
- Structural Mechanics . . . . . Dynamics and statics of solid bodies; kinematics, kinetics, shock and vibration, stress analysis.

### URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

- Environmental Management and  
Planning . . . . . Air, water, noise and waste management and control; monitoring services, solid waste and recycling; solid waste landfills; water quality management; environmental surveys, design and operation of sewer systems; water supplies and services management.
- Housing Planning and  
Construction . . . . . Surveys and assessments of existing housing, planning and construction; enclosure systems for human activity interest; housing renovation.

APPLICATION AREA

EXPERTISE

Economic Planning. . . . . Economic analyses; population-economy-  
income studies; quality of life.

CONTACT:

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Associate Technical Director  
USACERL  
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Champaign, IL 61820  
Telephone: (217) 352-6511

COAST GUARD RESEARCH AND DEVELOPMENT CENTER  
Avery Point, Groton, Connecticut 06340

APPLICATION AREA

EXPERTISE

ENVIRONMENTAL POLLUTION TECHNOLOGY

Marine Pollution Technology . . . Oil identification. Hazardous substance identification and quantification. Oil pollution trajectory forecasting. Oil pollution trajectory hindcasting. Spill prevention equipment (damage control). Spill containment devices. Hazardous chemical damage control and containment.

NAVIGATION, GUIDANCE AND CONTROL

Marine Navigation Technology. . . Aids to navigation. Solar power. Precision electronic navigation systems.

OCEAN TECHNOLOGY AND ENGINEERING

Domestic and Polar Ice  
Technology. . . . .

Ice theory as it applies to characterization of ice occurring in navigable waters. Field testing supporting polar and domestic icebreakers. Iceberg technology including, size, distribution and deterioration. Physical oceanography relating to drift characteristics of ice. Ice physics. Cold region equipment.

Marine Fire and Safety  
Research. . . . .

Full scale ship fire testing. Boating safety. Examination of technology of equipment, application and physical/chemical processes of fires and fire fighting. System safety analysis as it applies to marine fire and recreational boating (RB) processes. Theoretical naval architecture, addressing RB problems. Automated data collection/processing and associated instrumentation.

## APPLICATION AREA

## EXPERTISE

Search and Rescue Technology. . Search and rescue equipment development. Rescue equipment technology, rescue techniques and search effectiveness. Application of operations research and modeling techniques for improved planning and resource allocation.

## TRANSPORTATION

Marine Traffic Management . . . Vessel traffic management software. Microprocessor development. Computer assisted radar vessel tracking. Modularized computer display and processing techniques. Vessel traffic data acquisition systems.

CONTACT: D. L. Birkimer  
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Center  
Avery Point, Groton, CT 06340  
Telephone: (203) 445-8501

CHEMICAL SYSTEMS LABORATORY  
Aberdeen Proving Ground, Maryland 21010

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology Transition . . . Experience in administration of multi-  
disciplinary basic and applied research  
programs in the physical sciences.

AERONAUTICS AND AERODYNAMICS

Aeroballistics. . . . . Liquid filled projectiles.

ATMOSPHERIC SCIENCE

Monitoring. . . . . Instrumentation for monitoring atmos-  
pheric pollutants. Plant monitors,  
field monitors (automatic/portable).  
Devices to detect subhazardous con-  
centrations of toxic materials in air,  
water, or on surfaces.

BIOMEDICAL TECHNOLOGY AND HUMAN  
FACTORS ENGINEERING

Life Support Systems. . . . . Individual and collective protection  
against chemical and biological  
aerosols.

CHEMISTRY

Analytical Chemistry. . . . . Broad capability in detection, identi-  
fication, and analysis of compounds  
using a variety of modern techniques  
including gas chromatography, mass  
spectrometry (GC and ionic cluster),  
microanalysis, electron microscopy,  
atomic absorption, infrared, and Raman  
(Lasar) analyses.

Basic and Synthetic Chemistry . . Synthesis of full range of organic com-  
pounds, and reactions of chemical com-  
pounds with human chemistry.

## APPLICATION AREA

## EXPERTISE

Industrial Chemistry and  
Chemical Process  
Engineering . . . . . Pilot plants and process technology.

Physical and Theoretical  
Chemistry . . . . . Physical property data, reaction  
kinetics, and thermodynamics.

General . . . . . Broad capability in basic and applied  
research.

## COMPUTERS, CONTROL, AND INFORMATION THEORY

Computer Software . . . . . Preparation of computer programs to  
predict aerodynamic stability of  
liquid filled projectiles.

Pattern Recognition and Image  
Processing. . . . . Use of chemometrics in reduction of  
chemical data and correlation of  
chemical structures to pharmacological  
activity.

Use of pattern recognition techniques  
to predict recovery or non-recovery  
of shock-trauma patients.

## DETECTION AND COUNTERMEASURES

Electromagnetic and Acoustic  
Countermeasures . . . . . Smokes and aerosols.

## ENERGY

Fuel Conversion Processes . . . . Coal gasification.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control . . . . Real time air pollutant monitoring  
and sampling techniques.

Environmental Impact  
Statement . . . . . Preparation, review, and evaluation.

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## APPLICATION AREA

## EXPERTISE

Pesticides Pollution and Control . . . . .	Water testing kits, decontamination and destruction.
Solid Wastes Pollution and Control . . . . .	Decontamination and removal of hazardous materials.
Water Pollution and Control . . . . .	Manufacturing residues from chemical plants, detection of residual contaminants, and sampling techniques.
General . . . . .	Broad capability to perform research. Environmental surveys, pollution detection and monitoring, chemical treatment technology.

## HEALTH PLANNING

Health Care Technology. . . . .	Use of pattern recognition techniques to predict recovery of shock-trauma patients.
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## LIBRARY AND INFORMATION SCIENCE

Information Systems . . . . .	Retrieval of information on toxicological properties of chemical compounds, and chemical properties.
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## MATERIALS SCIENCES

General . . . . .	Basic and applied research capability.
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## MATHEMATICAL SCIENCES

Statistical Analysis. . . . .	Handling of data and design of experiments; univariate and multivariate statistical analysis; designed experiments; feasibility studies; hazard analysis; model building.
Systems Analysis. . . . .	Comparative cost effectiveness studies; threat analysis; simulation.

## APPLICATION AREA

## EXPERTISE

### MEDICINE AND BIOLOGY

Botany . . . . . Effects of pollutants on vegetation.

Clinical Medicine. . . . . Treatment methods for poisoning by  
fluorine-phosphorous compounds.

Ecology. . . . . Effects of pollutants of fauna, flora,  
etc.

Pharmacology and  
Pharmacological Chemistry. . . Treatment of poisoning by anti-  
cholinesterase compounds.

Psychology . . . . . Decrement of performance evaluations  
of prophylactic and therapeutic  
drugs.

Toxicology . . . . . Data bank on any known toxic compound.

### ORDNANCE

Ammunition, Explosives and  
Pyrotechnics . . . . . Riot control agents and dispersers.  
Noise, light, smoke and heat gener-  
ators; ordnance simulators.

Armor. . . . . Lightweight bullet-proof garments.

### PHYSICS

General. . . . . Research on aerosols, air filtration,  
air sampling.

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ENVIRONMENTAL RESEARCH LABORATORY, NARRAGANSETT  
South Ferry Road, Narragansett, Rhode Island 02882

APPLICATION AREA

EXPERTISE

CHEMISTRY

Analytical Chemistry . . . . . Analysis of pollutants in marine waters, sediments and organisms.

ENERGY

Geothermal Energy. . . . . Measurement of biological effects of introduction of thermal effluents - chemical and physical impact of one-through cooling.

ENVIRONMENTAL POLLUTION AND CONTROL

Water Pollution and Control. . . Standardized measurement of effects of pollutants on marine organisms and ecosystems using both lethal and sublethal indicators - particularly oils and metals. Computerized analysis of motion of particles or organisms in water. Use of chemical, physical, and biological techniques to measure pollutant buildup, translocation, and transformation.

CONTACT: Dr. Stanley H. Hargre  
Environmental Protection Agency  
Environmental Research Laboratory  
South Ferry Road  
Narragansett, Rhode Island 02880  
Telephone: (401) 789-1071

U.S. ARMY ENGINEER TOPOGRAPHIC LABORATORIES  
 Fort Belvoir, Virginia 22060

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ASTRONOMY AND ASTROPHYSICS</u>	
Astronomy and Celestial Mechanics. . . . .	Modification of astrogeodetic (wild T4) and other sensors. Orbit compu- tations (short and long arc deter- minations). Geometric and dynamic position determination. Recovery of gravitational field.
<u>CHEMISTRY</u>	
Photo and Radiation Chemistry . . . . .	Laboratory facility and expertise to test all types of photo emulsions, includes evaluation.
<u>CIVIL ENGINEERING</u>	
General. . . . .	Use of interdisciplinary photo- interpretation for urban planning, land-use, construction sites. Soils and rock mechanics and their relation- ship to military planning and operation.
<u>COMPUTER, CONTROL AND INFORMATION THEORY</u>	
Computer Hardware. . . . .	General purpose scientific computers. Mini computers as controllers. Parallel processors.
Computer Software. . . . .	Digitized terrain models. Image simulation. Cartographic data manip- ulation and symbolization.
Pattern Recognition and Image Processing . . . . .	Interactive pattern recognition which relies on human intervention. Search operations by sampling. Dynamic range compression and expansion. Stereo presentation by anaglyph. . . . mensuration. Pseudo color analysis and presentation.

## APPLICATION AREA

## EXPERTISE

### DETECTION AND COUNTERMEASURES

Optical Detection. . . . . On a limited basis, coherent optical analysis using the power spectrum of photo images can be used to detect special objects and vehicles.

### ELECTROTECHNOLOGY

Optoelectronic Devices and Systems. . . . . Pockels Read-only Modulator (PROM) device used as a spatial light modulator for image processing and pattern recognition. Acousto-optical device for the acoustic modulation of crystals for scanning with laser beams. Sensing arrays as a sampling sensor within a scanner. Hybrid optical-digital system for pattern recognition. Optical sampling and digital classification. Devices for cartographic data and terrain elevation extraction from photography. Exploitation of Charge Couple Devices. Optical Fast Fourier Transform (DEFT).

### MATHEMATICAL SCIENCE

General. . . . . All aspects of mathematics except operations research are used for research in the topographic and geographic sciences. Array algebra as a subset of matrix theory. Finite elements to replace finite difference approach to numerical solution of differential equations. Correlation algorithm divided into concurrent elements for parallel processing. Mathematical terrain modeling using weighting function interpolation.

### MEDICINE AND BIOLOGY

Botany . . . . . Correlations of vegetation with soil type and soil depth from aerial imagery.

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## APPLICATION AREA

## EXPERTISE

### NATURAL RESOURCES AND EARTH SCIENCES

- Cartography. . . . . Topography map design and test methodology. Map symbolization and type placement. Semiautomated cartography including hardware and software to expedite the cartographic and map revision processes.
- General. . . . . Studies depicting inventories of natural and cultural resources of selected military bases. Aspects of earth sciences as they relate to military planning and operations. Specific elements are: Cross country mobility, cover and concealment, lines of communication and fields of fire.

### NAVIGATION, GUIDANCE AND CONTROL

- Navigation and Guidance  
System Components . . . . . Analog and digital reference scenes for aircraft or missile en route. Navigation and/or terminal guidance correlation systems. Simulation of radar and radiometric terrain images for guidance systems using correlation techniques.
- Navigation Systems . . . . . Inertial technology for vehicular position and azimuth determination. Ground experiments on foliage penetration and multi-path aspects of the global positioning system. Adaptation of inertial technology to determine gravity anomalies and deflections of the vertical.

### PHOTOGRAPHY AND RECORDING DEVICES

- Holography . . . . . Holographic techniques for image mensuration. Holographic multiple-image storage. Holographic filters for pattern recognition.

APPLICATION AREA

EXPERTISE

Recording Devices. . . . . Real-time optical modulators (PROM).  
Photographic materials for holography.  
Optical-digital storage mediums and  
devices.

Photographic Techniques and  
Equipment. . . . . Development of continuous surface  
imaging devices. Photographic image  
quality analysis.

CONTACT: Dr. Kenneth R. Kothe  
U.S. Army Engineer Topographic  
Laboratories  
Fort Belvoir, Virginia 22060  
Telephone: (703) 664-5828  
Autovon: 354-5828

FBI LABORATORY  
Washington, D.C.

APPLICATION AREA

EXPERTISE

CHEMISTRY

Analytical Chemistry . . . . . Chemical examinations of materials of evidentiary nature in criminal matters.

MATERIALS SCIENCES

Fibers and Textiles. . . . . Microscopic comparisons/examinations of hairs/fibers/fabrics of evidentiary nature in criminal matters.

General. . . . . Examinations/comparisons of general categories of materials of evidentiary nature in criminal matters such as soils, glass, metals, drugs, plastics, petroleum products, chemicals, dyes/inks, gun powder residues, bombs, blood/tissue, hairs, fibers, fabrics, toolmarks, tools, guns, ammunition, explosives, poisons, fuels, typewriting, handwriting, photographs, plaster casts.

MEDICINE AND BIOLOGY

Immunology . . . . . Determination of origin of body fluids.

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Police . . . . . Forensic science research and development.

URBAN AND REGIONAL TECHNOLOGY AND  
DEVELOPMENT

Law Enforcement. . . . . Specialized instruction/courses in forensic science for local law enforcement crime laboratory scientists.

CONTACT:

Dr. C. G. McWright  
Federal Bureau of Investigation  
Department of Justice, FBI Laboratory  
9th and Pennsylvania Avenue, N.W.  
Washington, D.C. 20535  
Telephone: (202) 324-4420

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U.S. FOREST SERVICE  
Forest Fire Laboratory  
4955 Canyon Crest Drive Post Office Box 5007  
Riverside, California 92507

APPLICATION AREA

EXPERTISE

ATMOSPHERIC SCIENCES

Meteorological Data Collection,  
Analysis, and Weather

Forecasting . . . . . Collection, processing and trans-  
mission of meteorological data from  
remote sites by satellite relay and  
telemetering.

Meteorological Instruments and  
Instrument Platforms. . . . .

Instruments for measuring meteoro-  
logical parameters in conjunction  
with remote stations.

NATURAL RESOURCES

Forestry. . . . . Forestry, range, atmospheric, and  
forest fire research.

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Police, Fire, and Emergency  
Services. . . . .

Wildland fire protection planning;  
development of multi-agency coordi-  
nation systems; application of sys-  
tems technology to wildland fire  
management problems.

CONTACT: Mr. Richard Chase  
Forest Fire Laboratory  
Post Office Box 5007  
Riverside, California 92507  
Telephone: (714) 787-1579

FAIRBANK HIGHWAY RESEARCH STATION  
Washington, D.C.

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology Transfer. . . . Technology transfer program.

AERODYNAMICS

Test Facilities. . . . . Wind tunnel.

CIVIL ENGINEERING

Highway Engineering. . . . . Highway engineering.

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Transportation . . . . . Highway engineering.

URBAN AND REGIONAL TECHNOLOGY AND  
DEVELOPMENT

Transportation and Traffic  
Planning . . . . . Transportation planning traffic  
engineering.

CONTACT:  
Milton P. Criswell  
Federal Highway Administration  
HDV-20  
2100 2nd Street, S.W.  
Washington, D.C. 20590  
Telephone: (202) 426-9230



FOREST SERVICE, LABORATORIES  
U.S. Department of Agriculture  
Washington, D.C. 20013

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology Transfer. . . . Technology transfer program.

ENERGY

Energy Use, Supply and  
Demand . . . . . Studies concerning use of wood.

ENVIRONMENTAL POLLUTION AND  
CONTROL

Solid Wastes Pollution and  
Control. . . . . Techniques on recycling of waste wood  
products.

HEALTH PLANNING

Environmental and Occupational  
Factors. . . . . Studies on value of trees to the  
environment.

MATERIALS SCIENCES

Materials Degradation and  
Fouling. . . . . Information on wood deterioration,  
decay; prevention and control work.

MEDICINE AND BIOLOGY

Botany . . . . . Information on tree anatomy, physiol-  
ogy, and pathology.

Ecology. . . . . Information on trees in regard to  
their environment.

NATURAL RESOURCES AND EARTH  
SCIENCES

Mineral Industries . . . . . Information on the reclamation of  
strip-mined areas.

## APPLICATION AREA

## EXPERTISE

Natural Resource Management. . . Information on the conservation and management of forested lands, grasslands, wildlife, water, and fire.

Natural Resource Surveys . . . . Ongoing surveys of timberland.

Forestry . . . . . Information on all aspects of forestry.

## URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

Environmental Management and Planning . . . . . Information on how vegetation can be utilized in improvement of urban environments.

Housing. . . . . Information on proper insulation and also on housing renovations.

CONTACT: Harold G. Marx  
Forest Service, Office of Deputy Chief,  
Research, U. S. Dept. of Agriculture  
14th & Independence Ave. Rm 3112  
Washington, D. C. 20250  
Telephone: (202) 447-7573

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HARRY DIAMOND LABORATORIES  
Adelphi, Maryland 20783

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Computer Application. . . . . Data base systems for management.

Research Program Administration  
and Technology Transfer . . . . Research and development planning,  
contract management, technology  
transfer program.

ATMOSPHERIC SCIENCES

Monitoring. . . . . Instruments for measuring the physical  
characteristics of fog and rain.

Physical Meteorology. . . . . Properties of fog and rain affecting  
radio, radar, and laser propagation.

BIOMEDICAL TECHNOLOGY AND HUMAN  
FACTORS ENGINEERING

Biomedical Instrumentation and  
Bioengineering. . . . . Cardiac monitoring, PVC recognition  
system, telemetry, monitors of respi-  
ratory gases, computer simulation of  
the cardio-respiratory system.

Life Support Systems. . . . . Sensors for respirators and high  
altitude oxygen supply systems.

Prosthetics and Mechanical  
Organs. . . . . Blood pump to replace heart during  
surgery, heart-lung machine R&D,  
respirators.

General . . . . . Federal Laboratory Consortium con-  
tact for biomedical technology.

## APPLICATION AREA

## EXPERTISE

### CHEMISTRY

#### Physical and Theoretical

Chemistry . . . . . Electrochemistry, battery chemistry, theoretical surface chemistry, molecular dynamics.

Polymer Chemistry . . . . . Potting compounds for electronic circuits.

### COMMUNICATION

#### Radio and Television

Equipment . . . . . Portable radio equipment, telemetry.

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Software . . . . . Graphics program design.

#### Control Systems and Control

Theory. . . . . Digital control systems design.

#### Pattern Recognition and

Image Processing. . . . . Image processing.

General . . . . . Computer control of experiments, automated data acquisition, and simulation.

### DETECTION AND COUNTERMEASURES

Acoustic Detection. . . . . Acoustic intrusion and motion detectors for use in both air and water media.

#### Electromagnetic and Acoustic

Countermeasures . . . . . Radar and laser detection and ranging of people and vehicles, motion detection.

#### Infrared and Ultraviolet

Detection . . . . . IR pulsed laser measurement.

Magnetic Detection. . . . . Detection and analysis of magnetic signatures.

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## APPLICATION AREA

## EXPERTISE

Personnel Detection . . . . . Acoustic and radar intrusion detectors, seems to prevent surreptitious entry.

General . . . . . Acoustic and radar intrusion detectors, seems to prevent surreptitious entry.

## ELECTROTECHNOLOGY

Antennas. . . . . VHF and UHF antenna design; small and low weight antenna systems, conformed antennas, stripline antennas.

Circuits. . . . . RF, AF, and digital microelectronics especially for severe environments and high "g" conditions.

Optoelectronics Devices and Systems . . . . . Surface acoustic wave devices, IR laser sources, modulators and measuring instruments.

Power and Signal Transmission Devices . . . . . Miniature microwave power sources.

Resistive, Capacitive and Inductive Components. . . . . Thin and thick film technology.

Semiconductor Devices . . . . . IC design, PIN diodes, microwave power sources.

General . . . . . Wide expertise in microwave radar systems, digital signal processing and telemetry.

## ENERGY

Batteries and Components. . . . . Special long shelf life, reserve instrument batteries.

Energy Use, Supply and Demand . . Fluidic process temperature controllers to prevent over heating in high temperature processes.

APPLICATION AREA

EXPERTISE

ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control . . . . Fluidic pollutant gas concentration sensors.

GOVERNMENT INVENTIONS FOR LICENSING

Electrotechnology . . . . . Electro-optical devices, ferroelectric devices.

Mechanical Devices and Equipment . . . . . Fluidic components, sensors, and systems.

Instruments . . . . . Fluidic gas concentration sensors.

HEALTH PLANNING

Health Care Technology. . . . . Federal Laboratory Consortium contact for biomedical technology.

INDUSTRIAL AND MECHANICAL ENGINEERING

Hydraulic and Pneumatic Equipment . . . . . Fluidic or flueric sensors and controls of all types.

LIBRARY AND INFORMATION SCIENCE

Information Systems . . . . . Computerized information systems with on-line access to National Technical Information Service, Defense Documentation Center, and the Smithsonian Science Information Exchange.

MATERIALS SCIENCES

Adhesives and Sealants. . . . . Potting materials for rugged electronics.

Plastics. . . . . Potting material, adhesives, dielectric materials.

## APPLICATION AREA

## EXPERTISE

### MATHEMATICAL SCIENCES

Operations Research . . . . . Statistics, system modeling, cost-effectiveness analysis, system optimization, dynamic programming (especially geometric programming).

### NUCLEAR SCIENCE AND TECHNOLOGY

Nuclear Instrumentation . . . . . Neutron and X-ray spectroscopy, ionizing radiation dosimetry.

### PHYSICS

Fluid Mechanics . . . . . Theoretical analysis of confined flowfields, computer solutions of the Navier-Stokes equation, flow visualization.

Optics and Lasers . . . . . Coherent optical sources, near millimeter adherent sources, open resonator cavities, heterodyne systems.

Solid State Physics . . . . . Theoretical and experimental expertise in the dynamics of charge carriers in amorphous insulators, electron spin resonance, Hall effect, nonlinear electron transport, acousto-optic effects, ferroelectric, LSI capabilities.

Plasma Physics. . . . . Theoretical calculations of the dynamic response of plasmas, experimental expertise on MEV and positive ion beams, diagnostic measurements with X-ray bent crystal spectrometers.

Radio Frequency Waves . . . . . Interactions of electromagnetic waves with matter.

General . . . . . Quantum theory, quantum electrodynamics.

APPLICATION AREA

EXPERTISE

TRANSPORTATION

Air Transportation . . . . . Crash recorders and crash research  
telemetry systems, clear air turbu-  
lence detection.

Pipeline Transportation. . . . . Flow measurement.

Road Transportation. . . . . Crash recorders and crash research  
telemetry systems, anti-skid brake  
system.

CONTACT: Mr. Clifford E. Lanham  
Harry Diamond Laboratories  
ATTN: DELHD-TT  
2800 Powder Mill Road  
Adelphi, MD 20783  
Telephone: (202) 394-2296  
Autovon: 290-2296

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U.S. ARMY HUMAN ENGINEERING LABORATORY  
Aberdeen Proving Ground, Maryland 21005

APPLICATION AREA

EXPERTISE

BIOMEDICAL TECHNOLOGY AND HUMAN  
FACTORS ENGINEERING

Human Factors Engineering. . . . Display and information systems for  
operational control of large systems.

ENVIRONMENTAL POLLUTION AND  
CONTROL

Noise Pollution and Control. . . Occupational and environmental  
measurements.

CONTACT: Donald Egner  
U.S. Army Human Engineering Laboratory  
Aberdeen, Maryland 21005  
Telephone: (301) 278-4567/4168  
Autovon: 283-4567/4168

AIR FORCE HUMAN RESOURCES LABORATORY  
Brooks AFB, Texas

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Practice. . . . . Management and organizational behavior.

Research Program Administration  
and Technology Transfer. . . . Research and development product utilization, technology transfer, contract management.

BEHAVIOR AND SOCIETY

Job Training and Career  
Development. . . . . Flying and technical training, job requirements, job classification, career progression, on-the-job training, and performance measurement (job evaluation).

Personnel Selection and  
Classification . . . . . Person-job matching, test development.

Psychology . . . . . Educational and industrial psychology, psychometrics, operations and cost analyses.

Social Concerns. . . . . Wide-spectrum utilization of women throughout USAF job specialities.

General. . . . . Man-vehicle interface, especially in flight simulation and maintenance simulation.

APPLICATION AREA

EXPERTISE

COMPUTERS, CONTROL AND INFORMATION  
THEORY

Computer Software. . . . . Modeling of manpower personnel system,  
occupational and assignment analyses,  
and development of computational  
algorithms for the behavioral sciences.

CONTACT: COL Ralph S. Hoggatt  
Chief, Applications Office  
Air Force Human Resources Laboratory  
Brooks AFB, TX 78235  
Telephone: (512) 536-3605

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INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION  
Forest Service, USDA  
Ogden, Utah

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology Transfer. . . . Technology Transfer.

NATURAL RESOURCES AND EARTH  
SCIENCES

Forestry . . . . . Information on all aspects of forestry.

CONTACT:  
Planning and Application AD  
Intermountain Experiment Station  
U.S. Forest Service  
507 - 25th Street  
Ogden, Utah 84401  
Telephone: (801) 586-6286

INSTITUTE FOR TELECOMMUNICATION SCIENCES  
Boulder, Colorado 80302

APPLICATION AREA

EXPERTISE

COMMUNICATIONS

General. . . . . General expertise in all elements of this application area.

Extensive expertise in the efficient use of the radio frequency spectrum, engineering and evaluation of communication systems and propagation and transmission of radio signals.

Current Institute programs utilize expertise in the following:

- Model performance tests
- Mobile satellite earth terminals
- Electronic message handling
- Microwave communication systems
- Evaluation of digital systems
- Optical communication systems
- Antenna design and measurement
- Atmospheric refractive index measurements
- Predicting propagation effects on radio systems

CONTACT: Dr. Bernard Wieder  
Institute for Telecommunication  
Sciences  
Boulder, Colorado 80302  
Telephone: (303) 499-1000 ext. 3484  
FTS: 323-3484

KENNEDY SPACE CENTER  
Kennedy Space Center, Florida 32899

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Inventory Control. . . . .	Inventory control system, stock level control methods, warehouse automation.
Management Information . . . . .	Zero base budgeting, equipment management, resource management, operations management, program management.
Research Program Administration and Technology Transfer. . . . .	Resources development and management, contract management, technical management, technology transfer for utilization and applications.

AERONAUTICS AND AERODYNAMICS

Avionics . . . . .	Aerodynamic/inertial/ballistic technology for devices and system operation. Navigation and flight control integration of systems composed of electronic, pneumatic, hydraulic, mechanical, etc., devices coupled to and by communication systems. Basic technology for design, integration, preflight testing, operation, and failure analysis of devices, components, systems and vehicles. GSE support equipment design, operation and logistic support.
Test Facilities and Equipment. . . . .	Space vehicle preflight test equipment, GSE, controls, altitude chambers, vibration, acoustic, chemical, pneumatic, failure analysis support, instrumentation checkout and support facilities, computer-driven automation test facilities and equipment, launch support facilities, landing facilities and recovery support.

## APPLICATION AREA

## EXPERTISE

### AGRICULTURE AND FOOD

Agricultural Chemistry . . . . . Support laboratory chemistry expertise.

Agronomy, Horticulture and  
Plant Pathology. . . . . Support laboratory expertise.

Agricultural Resource  
Surveys. . . . . Remote sensing from aircraft and  
satellite surveillance of earth re-  
sources calibrated by ground truths  
of temperatures, water turbidity, veg-  
etation growth, water resources, pol-  
lution, soil mapping, water runoff,  
etc.

### ASTRONOMY AND ASTROPHYSICS

Astrophysics . . . . . Property measurements of terrestrial  
and extraterrestrial materials.

### ATMOSPHERIC SCIENCES

Aeronomy . . . . . Research and instrumentation expertise  
in atmospheric gases as applied to  
ionization absorption and instrumenta-  
tion anomalies. Measurement of launch  
vehicle environmental effects.

Dynamic Meteorology. . . . . Research and development of systems  
to instrument and display weather  
phenomena.

Meteorological Data Collection,  
Analysis, and Weather  
Forecasting. . . . . NOAA/AF support and KSC elements exper-  
tise developed to support prelaunch  
and launch missions.

Meteorological Instruments  
and Instrument Platforms . . . . Systems development to instrument  
weather phenomena and display for NOAA  
support of prelaunch and launch mission.

Physical Meteorology . . . . . Development of meteorological instru-  
mentation.

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## APPLICATION AREA

## EXPERTISE

- Weather Modification . . . . . Experimentation with weather modification as a means to modify weather during launch operations.
- General. . . . . KSC meteorological NOAA support is for prelaunch and launch missions. Weather phenomena, especially lightning and related research, has been extensive at KSC.

## BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

- Prosthetics and Mechanical  
Organs . . . . . Development of prosthetic limbs.
- Biomedical Instrumentation  
and Bioengineering . . . . . Instrumentation, data gathering, storage, processing and analysis of medical data (systems), mammograms; biomedical stimulation.
- Human Factors Engineering. . . . . Man-machine integration and operation.
- Life Support Systems . . . . . Cryogenic "SCAPE" suit environmental development and operation; altitude chamber environment operation; space environment simulation.
- Bionics and Artificial  
Intelligence . . . . . Body stimulation (electrical). Computer generated analysis of medical statistical data.
- General. . . . . Research and development of special projects in human engineering. Mission oriented life support systems development and operation. Development of standards and measuring techniques for low level electromagnetic energy effects to personnel.

## BUILDING INDUSTRY TECHNOLOGY

- Architectural Design and  
Environmental Engineering. . . . . Design and construction of operational and mission support facilities. Environmental engineering to support mission and prevent environmental impact.



## APPLICATION AREA

## EXPERTISE

- Construction Management and  
Techniques . . . . . Facilities required for Center mission  
conceived, designed, constructed, man-  
aged, operated and maintained.
- Structural Analysis. . . . . Design engineering expertise for  
structures and facilities.
- Building Standards and Codes . . Design and construction of structures  
and facilities for operation and sup-  
port functions in mission support.
- Construction Materials,  
Components and Equipment . . . Commonplace and unique materials com-  
ponents and equipment; cryogenics,  
high temperatures, corrosion protection,  
exotic fuels and oxidizers, handling  
equipment, protective devices in line  
with mission.

## CHEMISTRY

- Analytical Chemistry . . . . . Chemical laboratory support operation  
and equipment, i.e., scanning electron  
microscope, gas chromatography, etc.
- Polymer Chemistry. . . . . Characterization of polymers by weight,  
chemical, physical and electrical pro-  
perties and other properties as applied  
to engineering, operation and analysis.
- Physical and Theoretical  
Chemistry. . . . . Laboratory for mission support of launch  
center with investigative techniques for  
materials in analysis of failures requi-  
ring knowledge and expertise of physical  
and theoretical chemistry.

## CIVIL ENGINEERING

- Soil and Rock Mechanics. . . . . Structural analysis for load bearing  
capabilities of supporting soil and  
rock.

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## APPLICATION AREA

## EXPERTISE

### COMMUNICATIONS

#### Radio and Television

Equipment. . . . . Design, installation, test, maintenance of space and terrestrial equipment and supporting GSE ground tracking radar, DF, interferometers, transponders, telemetry, detection, instrumentation systems, remote control command systems, etc.

Common Carrier and Satellite . . Microwave RF and carrier bay relay systems; satellite and/or vehicle telemetry tracking instrumentation.

Graphics . . . . . Mechanical, electronic, printed, chemical, alphanumeric, plotting, static and dynamic displays design, operation maintenance; "Image 100" analysis and display. Computer graphics, auto-graphics.

#### Communication and Information

Theory . . . . . Analog and digital information transmission reception processing, e.g., bandwidth considerations, data bit rate, etc.

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Commercial computers use individually, and systems; systems computer driven automated checkout equipment; fabricated computers and electronic logic circuits.

Computer Software. . . . . Programs for hardware of GSE and support equipment; space vehicle computer programs development and programming.

#### Control Systems and Control

Theory . . . . . "Automatic Checkout Equipment" (ACE), Launch Processing System (LPS); systems designed for prelaunch and launch mission capability; time base

## APPLICATION AREA

## EXPERTISE

### Control Systems and Control

Theory (contd) . . . . . requirements of launch schedule drives complex automated testing, propellant loading, automatic sequencing.

### Information and Processing

Standards. . . . . Standards of format for equitable utilization of computer capabilities for intended use; selection of data techniques for maximum reliability or loss and misinterpretation of data.

Information Theory . . . . . Analysis of transmission data requirements and formulation of equipment and systems to fulfill requirement.

### Pattern Recognition and

Image Processing . . . . . Image enhancement techniques and analysis; Image 100 color analysis and presentation; dynamic prediction of trend by computer programming; analog to digital conversion and processing; feature extraction and enhancement; development of a ground operations computer language (special purpose languages).

## DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . . Instrumentation of noise generated by launches; dead room; sound propagation research and development devices.

### Electromagnetic and Acoustic

Countermeasures. . . . . Radar and laser instrumentation and systems.

### Infrared and Ultraviolet

Detection. . . . . Infrared and ultraviolet instrumentation.

Magnetic Detection . . . . . Magnetic and magnetic effects instrumentation, e.g., lightning current measurement.

Optical Detection. . . . . Optical tracking instrumentation; fiber optics communications systems.

## APPLICATION AREA

## EXPERTISE

Radio Frequency Detection. . . . EMI surveillance and detection; radio, radar, systems, etc.

Seismic Detection. . . . . Instrumentation of earth parameters.

## ELECTROTECHNOLOGY

Antennas . . . . . Design, innovate, fabricate devices, systems, test (anechoic chamber), instrument, calibrate, operate antenna farms, facilities, GSE and vehicle.

Circuits . . . . . Design, innovate, fabricate components systems test, calibrate, operate for GSE and vehicles, repair and support.

Electromechanical Devices. . . . Electrical motors, generators, drives, etc. large and small devices and systems.

Electron Tubes . . . . . Systems utilization, cathode ray, image orthicaon, etc., RF, audio, microwave.

Optoelectronic Devices and Systems. . . . . Fiber optics development, operation, tracking devices, detection systems.

Power and Signal Transmission Devices. . . . . Power generation, transformation, transmission systems, cable, waveguides, antennas, protective devices, insulators, filters, etc.

Resistive, Capacitive and Inductive Components . . . . . System utilization design, innovation development.

Semiconductor Devices. . . . . Power devices, systems component utilization, e.g., mission support GSE and flight hardware, integrated circuitry, drive, instrumentation detection, resolution, logic and computer devices, launch processing and support equipment.

## APPLICATION AREA

## EXPERTISE

### ENERGY

- Energy Use, Supply and Demand . . . . . Management of energy consumption and capacity; supply and demand; supply and projections; technological advances and impacts on environment, population and industry; energy conservation methods, techniques and hardware for energy conservation.
- Electric Power Transmission. . . Engineering design and construction of facility support capability to support launch center mission for electric power transmission and distribution.
- Heating and Cooling Systems. . . Facility heating and cooling design; design and construction and maintenance of cryogenic systems to support space vehicle launch operations with inherent need for isolating and insulating techniques.
- Engine Studies . . . . . Research of energy components in exhaust causing ionization, conducting and absorption of electrical and electromagnetic energy as applied to rocket motors.
- Solar Energy . . . . . Solar collectors, systems design, testing and evaluation; facility design for insulation from solar energy; remote sensing and calibration of sensing instrumentation.
- Miscellaneous Energy Conversion and Storage. . . . . Fuel and oxidizer storage and transfer systems; cryogenics storage and handling; system design for chemical/electrical energy storage; lightning research and protective systems and measures.

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## APPLICATION AREA

## EXPERTISE

### ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . .	Sensing systems for Booster Exhaust Systems Test (BEST).
Noise Pollution and Control. . .	Sound measurements of launch vehicles.
Solid Wastes Pollution and Control. . . . .	Studies of known and used disposal methods on a world-wide and national basis completed.
Water Pollution and Control. . .	The following advanced and improved concepts and laboratory tests: Pond aeration of liquid waste, pond oxygenation, pond chlorination, pond ozonization, chemical neutralization, absorption by water hyacinths, bacterial decomposition; measurements of noxious vegetation clogging fresh water bodies.
Pesticides Pollution and Control. . . . .	Investigations in the use of remote sensing for detection of diseased citrus trees; sensing of pesticide runoff.
Radiation Pollution and Control. . . . .	Instrumentation and sensing of radiation and control of devices in use.
Environmental Health and Safety . . . . .	Occupational health facility and statistical data gathering for normal and stress conditions; computerized systems for Medical Information Management Systems (MIMS) and Computer Assisted Diagnostics (CAD).
Environmental Impact Statements . . . . .	Facility developments requiring impact statements and research for impact to the National Wildlife Refuge; NFWS-FWS cooperative effort at KSC.

## APPLICATION AREA

## EXPERTISE

General. . . . . Laboratory support for analyzing various aspects of pesticides, chemicals, agricultural needs, etc.

### GOVERNMENT INVENTIONS FOR LICENSING

Mechanical Devices and Equipment. . . . . Disclosures developed resulting from KSC expertise; design, operations and innovations.

Biology and Medicine . . . . . Devices developed from expertise in allied field; artificial limbs, interface electrodes, etc.

Metallurgy . . . . . Support laboratory expertise developed technology.

Electrotechnology. . . . . Systems design of launch and operation/checkout oriented systems.

Instruments. . . . . Test support instrumentation developed systems and special projects development support; lightning research, atmospheric instrumentation, tracking devices, remote sensing, transducers and systems, etc.

Optics and Lasers. . . . . Systems development and devices for KSC mission.

Ordnance . . . . . Ordnance use and test methods.

### HEALTH PLANNING

Planning Methodology . . . . . Occupational health program for KSC, Medical Information Management System Computer Assisted Diagnostic and other automated medical programs.

Agency Administrative and Financial Management . . . . . Operation of health facility; planning for future needs.

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<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
Health Care Assessment and Quality Assurance. . . . .	Federal Employee Health Program, qualification, education and testing program for hazardous operations.
Health Care Measurement Methodology. . . . .	Stress laboratory testing and statistical data correlation.
Environmental and Occupational Factors. . . . .	Program for safety of personnel engaged in toxic fuels and oxidizers, cryogenic liquids and ordnance materials.
Health Care Technology . . . . .	Technology as applied to KSC mission.
Personal Health Care Services. .	Facility and services to support KSC mission and personnel involved.
Health Care Needs and Demands. .	KSC mission support; needs and demands of personnel in future programs.
Health Resources . . . . .	Medical facility and ancillary equip- ment, stress laboratory for statistical evaluation.
Health Education . . . . .	Program for dissemination of health information to employees.
Data and Information Systems . .	Medical Information Management System for storage of medical data; Computer Assisted Diagnostic and "INTERNIST" programs for future missions and com- puterizing of medical data. Image enhancement applied to X-ray and sound measurements of body tissue.

## INDUSTRIAL AND MECHANICAL ENGINEERING

Production Planning and Process Controls . . . . .	Support operations for KSC schedules and mission performance.
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## APPLICATION AREA

## EXPERTISE

Quality Control and Reliability. . . . .	Quality control and reliability at KSC level, design engineering, vehicle engineering, test support and support operations; organizations for specific functions of QC and reliability engineering.
Plant Design and Maintenance . .	Plant engineering and maintenance for support of KSC mission.
Environmental Engineering. . . .	Design engineering inclusive of environmental functions; instrumentation and measurement of Booster Exhaust Systems Tests.
Tooling, Machinery and Tools . .	Support tooling, machinery and tools for testing launch, and maintenance of equipment.
Manufacturing Processes and Materials Handling . . . . .	Special projects, components, systems design fabrication and materials control, traceability programs in government and contractors manufactured products.
Industrial Safety Engineering. .	Safety engineering and control of center activities associated with launch center operations.
Hydraulic and Pneumatic Equipment. . . . .	Ground support equipment for testing and launch operations.
Nondestructive Testing . . . . .	Support laboratory for testing, failure analysis and studies.

## LIBRARY AND INFORMATION SCIENCES

Information Systems. . . . .	Technical library for KSC support: computer services for payroll and personnel; computer controlled and automated testing and launch oriented information systems.
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## APPLICATION AREA

## EXPERTISE

### MATERIAL SCIENCES

General. . . . . A KSC materials program in association with the design center for vehicle, spacecraft and GSE materials control is enforced at KSC and at contractor facilities by the expertise of the responsible organization.

### MATHEMATICAL SCIENCES

Analysis (Mathematics) . . . . . Math modeling for projects and special studies; mathematical analysis for computer programs.

Operations Research. . . . . Support operations provides capability in additions to directorate functional capability.

Statistical Analysis . . . . . Statistical quality control and logistic support analysis; Center support in projects and studies, e.e., risk management systems.

### MEDICINE AND BIOLOGY

General. . . . . Research in image enhancement of body tissue instrumentation; X-ray and sound.

### NATURAL RESOURCES AND EARTH SCIENCES

Geology and Geophysics . . . . . Facility design engineering requires unique geological and geophysics expertise at KSC.

### NAVIGATION, GUIDANCE, AND CONTROL

Control Devices and Equipment. . . . . Instrumentation devices and systems design and fabrication; remote sensing, control and testing and operation.

Guidance Systems . . . . . Space vehicle/spacecraft guidance systems testing and operation.

## APPLICATION AREA

## EXPERTISE

### Navigation and Guidance

Systems Components . . . . . Devices for detection/sensing, instrumenting, combining and computing; testing.

Navigation Systems . . . . . Systems design, fabrication, testing and operations.

## NUCLEAR SCIENCE AND TECHNOLOGY

General. . . . . Testing of devices/systems aboard spacecraft; personnel safety and environmental protection measures.

## OCEAN TECHNOLOGY AND ENGINEERING

Oceanographic Vessels,  
Instruments and Platforms. . . Transport vehicles designed and operated for specific use in launch mission, i.e., transport by water of launch vehicle to launch site; launch support and recovery vehicles; underwater debris recovery.

## ORDNANCE

Ammunition, Explosives and  
Pyrotechnics . . . . . Launch vehicle, spacecraft, etc., ordnance storage, testing, installation.

## PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . . Laboratory support expertise.

Photographic Techniques and  
Equipment. . . . . Electronic image enhancement, infrared and visible mapping, temperature sensing and mapping; photo operation facility/ laboratory equipment; laboratory X-ray, Gamma ray, and clean room photo equipment; printed circuit photography; X-ray enhancement applied to materials analysis and special research of body tissue.

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## APPLICATION AREA

## EXPERTISE

- Recording Devices . . . . . Measurement display and recording laboratory; photo-magnetic tape, oscillograph, digital memory/computers punched tape/cards, instrumentation, etc.
- General . . . . . Launch support; photography, sound, environmental effects, etc.

## PHYSICS

- Acoustics . . . . . Sound spectrum and level measurements; ultrasonic cleaners, vibration testers and sound frequencies applied to non-destructive testing; audio/acoustic communication systems.
- Optics and Lasers . . . . . Optical communication systems; fibre optics.
- Radio Frequency Waves . . . . . Electromagnetic measurements and analysis; radio frequency systems design, fabricating and operation/tracking; electromagnetic discharge measuring/instrumentation systems.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

- Human Resources . . . . . Limited program of KSC individuals assigned to state as technology coordinator; limited availability for consulting by KSC technical staff based on workload.
- Police, Fire and Emergency Services . . . . . Cooperative operations with state and local services, e.g., deputized KSC patrol; special projects for fire protection equipment transferred to civil sector; transfer of special hazard equipment and facilities developed for support services.

## APPLICATION AREA

## EXPERTISE

Energy . . . . . Cooperative effort with Florida Solar Energy Center. Energy saving devices developed.

Environment. . . . . Center facility development environmentally conscious; KSC is a National Wildlife Refuge; special projects for wildlife preservation; Booster Exhaust Study Test of pollutants from launch vehicles.

Transportation . . . . . KSC support of Dade County (FL) mass transit program development, e.g., transfer of technology; special projects.

General. . . . . Designed facilities involving pipeline transportation of hazardous, non-hazardous, cryogenics, fuels, oxidizer, corrosive, noncorrosive, etc., liquids and gasses, piping above ground, below ground, underwater, etc.

## URBAN AND REGIONAL TECHNOLOGY DEVELOPMENT

Environmental Management and Planning . . . . . KSC facilities planning for launch oriented facilities, Visitors Information Center planning, Wildlife resources planning, waterways planning and environmental impacts, manpower and resources planning.

Communications . . . . . Networks of radio, wire, microwave telephone, wideband video circuits and terminals; optical communications.

Health Services. . . . . Occupational health services, training for hazardous services in cryogenics, toxic gases, etc.

APPLICATION AREA

EXPERTISE

Emergency Services and

Planning . . . . . Research and development in space age  
technology for use at KSC adaptive and  
transferred to civil sectors; special  
projects for civil development of  
services found functionally useful at  
KSC.

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 Hampton, Virginia 23665

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ADMINISTRATION</u>	
Inventory Control. . . . .	Equipment and stock management and control.
Research Program Administration and Technology Transfer. . . .	Financial management, analysis, and control; personnel and training; scientific program management operations; Technology Utilization and Applications Program management.
<u>AERONAUTICS AND AERODYNAMICS</u>	
Aerodynamics) Aeronautics ). . . . . Aircraft )	Fundamental and applied research in aerothermodynamics, fluid mechanics, propulsion aerodynamics, performance, stability and control, stall/spin, airfoil development, STOL/VTOL, in all flight regimes; conceptual studies; systems studies; aircraft design; requirements; safety and operating problems; wind tunnel and gas dynamics testing laboratories.
Parachutes and Decelerators. . .	Configuration development and test of transonic and supersonic decelerators.
Avionics . . . . .	Digital flight controls; active controls technology; terminal configured aircraft (operations, landing displays, flight testing); microwave landing systems; fluidics; automatic flight control systems.
Test Facilities and Equipment. .	Subsonic, transonic, and supersonic wind tunnels; V/STOL tunnel; full-scale wind tunnel; scramjet test facility; aircraft noise reduction facility; differential maneuvering simulator.

## APPLICATION AREA

## EXPERTISE

### ATMOSPHERIC SCIENCES

Aeronomy . . . . .	Fundamental processes; chemical rates; sources and sinks.
Dynamic Meteorology. . . . .	Severe storms and local weather re-search; climate sensitivity and model development.
Meteorological Data Collecting Analysis and Weather Forecasting. . . . .	Climate research; earth radiation budget experiment.
Meteorological Instruments and Instrument Platforms . . . . .	Microwave techniques for meteorological research.

### BEHAVIOR AND SOCIETY

Job Training and Career Development. . . . .	Planning, development, and administration of scientific and technical training programs.
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### BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

Biomedical Instrumentation and Bioengineering . . . . .	Application of aerospace instrumentation and materials to biomedicine and bioengineering.
Human Factors Engineering. . . .	Cockpit simulations; visual displays; eye tracking.

### BUILDING INDUSTRY TECHNOLOGY

Architectural Design and Environmental Engineering. . .	Planning and engineering for construction, maintenance, remodeling of buildings and interiors, and environmental systems.
Structural Analyses. . . . .	Analysis of structural engineering designs of research facilities and equipment.

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## APPLICATION AREA

## EXPERTISE

Building Equipment, Furnishings,  
and Maintenance. . . . .

Plan, direct, and coordinate technical,  
mechanical, electrical, and maintenance  
services for research facilities and  
equipment.

## CHEMISTRY

Polymer Chemistry. . . . .

Basic and applied research to develop  
and modify polymeric materials for  
aerospace applications.

Basic and Synthetic Chemistry. .

Chemistry of pollutant formation and  
interaction of pollutants with air and  
water.

Photo and Radiation Chemistry. .

Environmental effects on materials;  
development of molecular lasers;  
heterodyne spectrometry.

Physical and Theoretical  
Chemistry. . . . .

Reactor and photovoltaic power systems;  
flow field chemical kinetics.

## COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . .

Data handling requirements; design and  
development of specialized equipment.

Computer Software. . . . .

Development and application of advanced  
software and modeling techniques.

Control Systems and  
Control Theory . . . . .

Analysis, design, and synthesis of  
manual and automatic stability and  
control systems; optimization of  
mechanics problems; guidance theory  
and applications.

Information Processing  
Standards. . . . .

Development of programs, computational  
procedures, data recording, transmission,  
and presentation.

## APPLICATION AREA

## EXPERISE

Information Theory . . . . . Development of techniques and applications of mathematics and computer theory to solution of aerospace computational problems.

Pattern Recognition and  
Image Processing . . . . . Image restoration and enhancement; multispectral image data analysis and spectral reflectance estimation; multispectral data classification and compression.

## DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . . Duct acoustics; airframe noise research; acoustic methods for detecting stress in bolts.

Infrared and Ultraviolet  
Detection. . . . . Electronic materials; epitaxial growth techniques; electronic device processing; spectrometer and photometric systems; remote sensing applications.

## ELECTROTECHNOLOGY

Antennas . . . . . Tracking transponders.

Circuits . . . . . Control techniques; Kalman filtering; telemetry systems.

Electromechanical Devices. . . . . Experimental avionics systems; fly-by-wire techniques; prototype development of pneumatic, hydraulic, fluoric, and electronic controls.

Optoelectronic Devices and  
Systems. . . . . IR and UV detectors and arrays -- sensing, display, data handling.

Power and Signal Transmission  
Devices. . . . . Command and power systems and components; transducers; telemetry systems.

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## APPLICATION AREA

## EXPERTISE

Semiconductor Devices. . . . . Advanced solid state electronic device and sensor material processing and property technology; optimization of devices and associated systems.

## ENERGY

Heating and Cooling  
Systems. . . . . Systems requirements and design specifications for plant and research HVAC facilities.

Solar Energy . . . . . Design, test, evaluation of solar systems and components for space heating and cooling and water heating.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Measurement techniques and systems definition for remote sensing of atmospheric quality; lab and field tests; physical chemistry of atmospheric pollutants.

Noise Pollution and Control. . . . . Mechanism of noise generation; subjective response of people to aircraft noise; anechoic test facility; aircraft noise reduction laboratory.

Water Pollution and Control. . . . . Definition of systems and techniques for in situ and remote monitoring of marine environmental quality; lab and analytical study of physical chemistry of water pollutants.

## GOVERNMENT INVENTIONS FOR LICENSING

Mechanical Devices and  
Equipment. . . . . Hydrofoil system to direct and control outfall waste; fatigue failure load indicator; handlemeter for fabric "feel"; angular momentum control device; inkjet color printer control interface; inflatable life raft.

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## APPLICATION AREA

## EXPERTISE

Chemistry. . . . .	Diamine hardeners for epoxies; polyimide adhesives for titanium and composite bonding.
Biology and Medicine . . . . .	Miniature diaphragm valve for medical equipment; bacteria strain for eschar debridement.
Electrotechnology. . . . .	Very low-power power supplies; multiple layer printed wiring trace connector.
Instruments. . . . .	Miniature angular position transducer; edge-following algorithm for tracking geological features.
Optics and Lasers. . . . .	Optical profilometer; directional laser velocimeter; portable solar radiometer to measure stack plume effluents.

## INDUSTRIAL AND MECHANICAL ENGINEERING

Nondestructive Testing . . . . .	Development and utilization of methods to inspect material and structures for defects.
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## LIBRARY AND INFORMATION SCIENCES

Operations and Planning. . . . .	Management and operation of scientific and technical library facility.
Information Systems. . . . .	Operation of document retrieval terminal.

## MATERIALS SCIENCES

Ablative Materials and Ablation . . . . .	Development of ablative materials; experimental studies of ablators; high temperature materials lab and test facilities.
Adhesives and Sealants . . . . .	Research to develop and modify polymers for adhesive qualities.

## APPLICATION AREA

## EXPERTISE

Carbon and Graphite. . . . .	Characterization and behavior of structural materials; fatigue behavior.
Ceramics, Refractories, and Glass. . . . .	Materials testing.
Coatings, Colorants, and Finishes . . . . .	Basic and applied research on polymeric materials for films, thermal control or UV-resistant coatings.
Composite Materials. . . . .	Characteristics and behavior of resin-matrix and metal matrix composites; environmental tests and flight service evaluation; mechanisms of degradation and failure; structures and materials test lab.
Corrosion and Corrosion Inhibition . . . . .	Research to identify corrosion characteristics of advanced structural materials in operating environments.
Elastomers . . . . .	Investigation of elastomer additions to modify brittle high-temperature plastic materials.
Nonferrous Metals and Alloys . .	Evaluation of fracture characteristics; operation of fatigue lab.
Plastics . . . . .	Development of better resins and adhesives for graphite reinforced composites; environmental testing.

## MATHEMATICAL SCIENCES

Algebra and Number Theory. . . .	Development and application of mathematical and computer theory to solution of aerospace research problems.
Analysis (Mathematics) . . . . .	Development of mathematical analysis techniques; math models for solution of aerospace-related research.
Mathematical Logic . . . . .	Applications to computations in automatic data processing systems.

## APPLICATION AREA

## EXPERTISE

### NAVIGATION, GUIDANCE AND CONTROL

- Control Devices and Equipment. . . Design, development, and optimization of manual and automatic control systems for aircraft, spacecraft, entry vehicles.
- Guidance Systems . . . . . Analysis and prototype development of new concepts; application of control techniques (Kalman filtering) for inertial systems; flight experiments.
- Navigation and Guidance  
System Components. . . . . Evaluation and testing.
- Navigation Systems . . . . . Analysis and prototype development of advanced concepts; flight evaluation.

### NUCLEAR SCIENCE AND TECHNOLOGY

- Nuclear Auxiliary Power  
Systems. . . . . Gas core reactor power subsystems for future spacecraft applications.

### OCEAN TECHNOLOGY AND ENGINEERING

- Oceanographic Vessels,  
Instruments and Platforms. . . Requirements and systems for remote and in situ monitoring of environmental quality; verification tests of marine sensors.

### PHYSICS

- Acoustics. . . . . Duct acoustics; flow-surface interaction noise; noise generating mechanism; vorticity modeling.
- Fluid Mechanics. . . . . Aerodynamic heating; skin friction; interference flows; boundary layer transition; shear flow; recirculation flow; computational methods for 3-D boundary layers; mathematical modeling of fluid flow.

## APPLICATION AREA

## EXPERTISE

Optics and Lasers. . . . .	Laser and holography techniques; nuclear-pumped laser technology; remote sensing.
Solid State Physics. . . . .	Material properties and processing of advanced solid state electronic devices and sensors.
Structural Mechanics . . . . .	Mechanisms of degradation and failure in structural materials; fracture mechanics.
Plasma Physics . . . . .	Experimental studies of flow field chemical kinetics using shock tubes, expansion tubes, etc.
Radio Frequency Waves. . . . .	Research on techniques for radiation, propagation or scattering of electromagnetic energy related to communications, radiometric applications -- VLF through millimeter wave frequencies.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Energy . . . . .	Energy audits; solar heating applications; infrared thermography.
Environment. . . . .	Atmospheric pollution measurements; water quality measurements.

## TRANSPORTATION

Air Transportation . . . . .	Requirements for future aeronautical systems; conceptual designs; market demands; economic returns; technology impact; flight research.
Transportation Safety. . . . .	Aircraft airworthiness; develop airworthiness criteria; tests and simulator investigations; operating procedures.
Global Navigation Systems. . . .	Advanced technology planning for large area space systems.

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UNIVERSITY OF CALIFORNIA  
LOS ALAMOS SCIENTIFIC LABORATORY  
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Los Alamos, New Mexico 87544

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration and Technology Transfer. . . .	Industry Liaison--commercialization of research results, industrial participation programs; general research program administration.
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AGRICULTURE AND FOOD

Agricultural Chemistry . . . . .	Fertilizer utilization tracers (stable isotopes of C, N).
Agricultural Equipment, Facilities and Operations. . . .	Implantable transponder for large- animal identification and health monitoring.
Animal Husbandry and Veterinary Medicine. . . . .	Hyperthermia, using localized RF current fields for treatment of animal tumors, such as cattle "cancer eye"; rapid broad-spectrum disease detection by automated immunologic and cytofluorometric techniques; remote animal identifi- cation and state of health by passive implanted transponder.

ASTRONOMY AND ASTROPHYSICS

Astrogeology . . . . .	Lunar composition.
Astrophysics . . . . .	Astrophysical fluid dynamics; stellar hydrodynamics; pulsating variable stars; supernovae; properties of interstellar medium; stellar opacities.



## APPLICATION AREA

## EXPERTISE

Cosmic Ray Research. . . . .	Radiochemical monitoring of particle fluences in space.
General. . . . .	Solar phenomena; shaped charges for mapping the earth's magnetic field; special cameras and novel instruments.

## ATMOSPHERIC SCIENCES

Meteorological Data Collection, Analysis and Weather Forecasting. . . . .	Analysis of gases and particulate matter; tracing air flow patterns with mass 21 methane.
Meteorological Instruments and Instrument Platforms . . . . .	Airborne mass/size samples.
Physical Meteorology . . . . .	Heavy methane atmospheric tracers on regional and global scale.

## BEHAVIOR AND SOCIETY

Job Training and Career Development. . . . .	Electronic technician training; development programs for electronics staff.
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## BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

Biomedical Instrumentation and Bioengineering . . . . .	Portable hyperthermia equipment for cancer treatment; electronic instrumentation for tumor detection; implantable monitoring apparatus; cell sensing and sorting by flow cytofluorometry and light scattering.
Human Factors Engineering. . . . .	Display and information systems for operational control of large systems.
Life Support Systems . . . . .	Evaluation, selection and proper use of respirators; training in respirator use.

## APPLICATION AREA

## EXPERTISE

Prosthetics and Mechanical  
Organs . . . . . <sup>238</sup>Pu radioisotopic heat source fabrication for the artificial heart.

General. . . . . Radiopharmaceutical tracers.

## BUILDING INDUSTRY TECHNOLOGY

Architectural Design and  
Environmental Engineering. . . Control, monitoring of solar heating and cooling systems; explosion containment structures and vessels.

## CHEMISTRY

Analytical Chemistry . . . . . Gas, solids, spark-source, mass spectrometry; infrared, ultraviolet, visible and Fourier transform spectroscopy; electron and Auger spectroscopy; electron- and ion-beam microprobe analysis; scanning and transmission electron microscopy; gas and liquid chromatography; neutron activation analysis; NMR; atomic absorption; X-ray fluorescence and absorption; X-ray diffraction; radiochemical analysis; ion exchange resin and solvent extraction separations; fluorometry; inert-gas and vacuum fusion; wet-chemical analysis; neutron counting; visible and ultraviolet spectrophotometry; gamma scanning; gamma ray spectroscopy; titrations involving amperometric, coulometric, photometric and potentiometric measurements; analytical chemistry of Pu, U and other actinides; trace element analysis.

Basic and Synthetic  
Chemistry. . . . . Radiochemical techniques; actinide and transition element chemistry; synthesis of organic compounds containing <sup>13</sup>C, <sup>15</sup>N and <sup>18</sup>O for biochemistry, diagnosis and environmental tracers.

## APPLICATION AREA

## EXPERTISE

Industrial Chemistry and  
Chemical Process Engineering . Hot cell chemistry.

Photo and Radiation  
Chemistry. . . . . Laser photochemistry; laser-induced  
fluorescence; laser spectroscopy.

Physical and Theoretical  
Chemistry. . . . . Molecular structure (X-ray, NMR spec-  
troscopy); cross-beam dynamics;  
chemical kinetics: gas phase, aqueous  
redox; chemical thermodynamics:  
enthalpies of formation of minerals,  
metal oxides and carbides, free  
energy and activity in metal alloys;  
basic surfacstudies and interactions  
with gases including catalysis studies,  
by low-energy X-ray diffraction and  
Auger electron and photoelectron  
spectroscopy; explosive performance  
and theory, reaction times. Theore-  
tical molecular dynamics and molec-  
ular structure; reaction kinetics;  
thermochemistry. Fundamental inves-  
tigations of uranium optical spectra.

## CIVIL ENGINEERING

Soil and Rock Mechanics. . . . . Shockwave response (Hugoniot, stress-  
wave propagation, sound speeds, frac-  
ture, jet penetration, blast models).

General. . . . . Blastwave damage and safety.

## COMMUNICATION

Communication and Information  
Theory . . . . . Studies and implementation of fiber  
optic data communication system.

Radio and Television  
Equipment. . . . . Operation and maintenance of indus-  
trial radio systems.

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## APPLICATION AREA

## EXPERTISE

### COMPUTERS, CONTROL, AND INFORMATION THEORY

- Computer Hardware. . . . . Organization and logical design; special hardware design and maintenance; interactive systems; networks; graphics; color, three-dimensional, holographic; design and development of microprocessor systems; implementation of minicomputer systems.
- Computer Software. . . . . Language design and implementation; numerical analysis; symbolic computation; combinatorial algorithms; operating systems; data base systems; performance modeling and analysis; graphics; software portability; applications software for minicomputers and microprocessors; computer data acquisition and control.
- Control Systems and Control Theory . . . . . General expertise--e.g., building system controls, tracking systems for solar eclipse studies, NIM/CAMAC control systems.
- Pattern Recognition and Image Processing . . . . . Image digitizing and processing; feature extraction and enhancement.

### DETECTION AND COUNTERMEASURES

- Acoustic Detection . . . . . Ranging and bearing systems.
- Nuclear Explosion Detection. . . . . Seismic, teleseismic, earth electromagnetics, strain-tilt instrumentation.
- Seismic Detection. . . . . For nuclear explosion detection and yield verification.

### ELECTROTECHNOLOGY

- Antennas . . . . . Design, characterization and test of antenna systems in various propagation media.

## APPLICATION AREA

## EXPERTISE

Circuits . . . . .	High-speed signal detection, display and generation; fast transient analysis and recording; high-speed oscilloscope and digital systems; digital logic system design for numerous applications; nuclear applications.
Electromechanical Devices. . . .	Application to control of systems such as tracking platforms, nuclear reactors.
Electron Tubes . . . . .	R&D on high-temperature, ultraminia- ture, planar tubes, "integrated thermionics."
Optoelectronic Devices and Systems. . . . .	Design and test of optical signal systems; fast electro-optic detectors; fiber-optic transmission lines; high- speed avalanche photodiode fabrica- tion; X-ray intensifier screens; image intensifiers.
Power and Signal Transmission Devices. . . . .	Power system simulation.
Resistive, Capacitive and Inductive Components . . . . .	R&D into components for high-temperature instrumentation
Semiconductor Devices. . . . .	Detector and gain device design and fabrication; response to shockwaves.
General. . . . .	High-voltage engineering: systems, cables, switches; fast oscilloscope development (5-10 GHz); explosive- driven fuses, switches, generators; hybrid electronics facility for high reliability circuit development and fabrication, especially for space instrumentation.

## ENERGY

Electric Power Transmission. . .	Superconducting dc transmission and superconducting materials; modeling.
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<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
Energy Use, Supply and Demand. .	Mathematics of energy systems; economics and resource modeling; mathematical analysis of input-output economic-ecologic regional energy models.
Engine Studies . . . . .	Fluid dynamics of the internal combustion engine.
Environmental Studies. . . . .	Radionuclide migration; impact of trans-Alaska pipeline; hot rock geothermal energy; coal combustion in arid environments; shale extraction and processing; pollution transport; air sampling; stack monitoring; trace element analysis.
Fuel Conversion Processes. . . .	Design of thermochemical cycles for coal gasification and H <sub>2</sub> generation.
Geothermal Energy. . . . .	Hot rock geothermal energy; site selection and evaluation, reservoir analysis and modeling, high-temperature hard rock drilling, hydraulic fracturing, special instrumentation, environmental monitoring, high-temperature well-logging instrumentation, rock-water chemical interactions, energy transfer and conversion cycles, hydrodynamics of geothermal extraction systems.
Heating and Cooling Systems. . .	Modeling on hybrid computer.
Policies, Regulations and Studies. . . . .	Energy-economic-environmental studies for the Rocky Mountain Region.
Selected Studies in Nuclear Technology . . . . .	Electronuclear breeding feasibility experiments; radiation damage studies of fission and fusion reactor materials.

## APPLICATION AREA

## EXPENSE

Solar Energy . . . . . Active and passive systems for heating; absorption-chiller and Rankine cycle cooling; heat storage; development of handbooks for solar energy system design; thermochemical cycle design; modeling and monitoring of solar energy systems; collector and collector surface design.

Miscellaneous Energy Conversion and Storage . . . . . Superconducting magnet energy storage; electrochemical heat engine development; thermionic conversion and materials; all areas of nuclear energy.

General. . . . . Conservation--Heat recovery with heat pipes; Fossil--Performance of blasting agents; response of geologic materials (oil shale, devonian shale, coal etc.) to shockwaves and jets.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Industrial emission studies, sampling devices and transport measurements; high altitude sampling; SO<sub>2</sub> emission control.

Environmental Health and Safety . . . . . Radiation and hazardous chemical surveillance.

Environmental Impact Statements . . . . . Preparation, review and comment.

Noise Pollution and Control. . . . . Occupational and environmental measurements.

Radiation Pollution and Control. . . . . Low-level plutonium analyses; radionuclide migration; container, transport, and disposal technology, incineration of low-level radioactive wastes; liquid radioactive waste disposal; evaluation of current practice for transuranic nuclide disposal.

## APPLICATION AREA

## EXPERTISE

General. . . . . Environmental monitoring of geothermal reservoir development.

### GOVERNMENT INVENTIONS FOR LICENSING

Biology and Medicine . . . . . Flow microfluorometry.

General. . . . . "Subterrene" rock melting penetrator for specialized drilling applications.

### INDUSTRIAL AND MECHANICAL ENGINEERING

#### Manufacturing Processes and

Materials Handling . . . . . Fabrication of W, Ta and its alloys, Nb, Mo, including welding and joining, casting, metalcasting, rheocasting, thixotropic casting, computer simulation of casting processes; GTA welding, electron-beam welding, laser welding, HERF, explosive metal working and all conventional fabrication techniques; interlying distances, detonability, etc., of energetic chemicals.

Nondestructive Testing . . . . . All aspects, including explosives; neutron,  $\gamma$  and  $\beta$  radiography (including very low energy); ultrasonics; eddy current transmission and scattered radiation ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) gauging; potential drop; passive nuclear radiation; liquid penetrants for crack detection; acoustic emission; holography; magnetic particle; thermal conductivity; X-ray fluorescence; scanning electron microscopy; muonic X-ray analysis for elemental composition; computer-aided tomography.

#### Quality Control and

Reliability. . . . . Quality assurance for electronics fabrication.

Tooling Machinery and Tools. . . Explosive forming.



## APPLICATION AREA

## EXPERTISE

### MATERIALS SCIENCES

Ablative Materials and Ablation . . . . .	Carbide-graphite composites for nose cones and rocket nozzle insert applications.
Adhesives and Sealants . . . . .	Elastomer evaluation and development.
Carbon and Graphite. . . . .	Highly developed fuel element tech- nology has evolved based upon arti- ficial graphites and carbonaceous materials.
Ceramics, Refractories, and Glass. . . . .	Slip casting, cold press sintering, hot pressing of pure oxides, carbides, nitrides, mineral synthesis. Hot isostatic pressing, vacuum hot pressing, complete power character- ization, porcelain enameling, glazing, oxyacetylene and plasma-arc spraying, extrusion, joining, ceramic-to-metal seals, radiation damage in ceramics, mechanical properties of ceramic.
Coating , Colorants, Finishes. .	Electrochemical processes, CVD, PVD, sputtering, epoxy, painting, surface finishing.
Composite Materials. . . . .	Carbide-graphite composites, fiber reinforced composites.
Corrosion and Corrosion Inhibition . . . . .	Corrosion of ferrous and non-ferrous metals by $H_2$ ; corrosion of various steel and composition drum materials for containing radioactive wastes; evaluation of various corrosion inhibitors; effects of radiolysis and radiolysis products on corrosion.
Elastomers . . . . .	General development and processing of elastomers for seals, gaskets, corrosion resistance, etc.

## APPLICATION AREA

## EXPERTISE

Iron and Iron Alloys . . . . .	Metallurgical evaluations of fracture toughness, fabricability, weldability, and resistance to H <sub>2</sub> embrittlement. Expertise includes drop-weight-tear testing, notched and unnotched toughness testing; all types of mechanical and physical property measurement, GTA welding, electron beam welding, laser welding, HERF, explosive metal working and all conventional fabrication techniques.
Nonferrous Metals and Alloys . .	Physical metallurgy of noble metal (Pt- or Ir-based) alloys. Mechanical properties at high strain rates. Metal behavior under biaxial loading. Physical metallurgy of plutonium.
Plastics . . . . .	All methods of formulation, transfer, compression, injection molding, casting, potting, slurry coating, electrophoresis, etc.
Miscellaneous Materials. . . . .	Graphite technology, carbide-carbon composite fabrication and synthesis, chemical vapor deposition, physical vapor deposition, sputtering, thin and thick film technology.
Refractory Metals and Alloys . .	Evaluation of W, Ta and its alloys, Nb, Mo.
General. . . . .	<u>Induction Heating:</u> RF generator design and control; induction furnaces to 4000°C; melting without crucibles; heavy duty self-shielding induction heating coils; directional solidification; induction plasma above 15,000°C; high frequency power distribution and control; brazing and welding; special alloys; wide variety of spheres; material purification; vaporization; thermal shock. <u>Optical Materials;</u> Fabrication, polishing, laser damage measurements. Shockwave response, R&D and clean room for fabrication of nuclear particle detector semiconductor and rare-gas liquid materials.

## APPLICATION AREA

## EXPERTISE

### MATHEMATICAL SCIENCES

Algebra and Number Theory. . . .	General competence.
Analysis (Mathematics) . . . . .	General competence.
Geometry . . . . .	General competence.
Mathematical Logic . . . . .	General competence.
Operations Research. . . . .	Linear and nonlinear modeling and optimization; data base management; Bayesian reliability; cost-benefit studies.
Statistical Analysis . . . . .	Statistical theory and methodology in all areas and diverse applications.
General. . . . .	Initial- and boundary-value problems; combinatorial theory; group theory; numerical error sensitivity analysis; numerical solution to nonlinear partial differential equations; numerical algorithm development.

### MEDICINE AND BIOLOGY

Biochemistry . . . . .	Interactions between nucleic acids, basic proteins, and energy-related toxic materials.
Cytology, Genetics and Molecular Biology. . . . .	Somatic cell genetics; mutagenicity testing; cytogenetics; damage and repair, cell synchronization techniques; teratogenic systems; multi-parameter cell analysis; <u>in vivo</u> and <u>in vitro</u> carcinogenicity testing; basic research in photosynthesis.
Immunology . . . . .	Theoretical modeling of immune response; immunofluorescence enzyme immunoassays; antibodies.

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## APPLICATION AREA

## EXPERTISE

Public Health and Industrial  
Medicine . . . . . Epidemiological studies of plutonium  
workers; tissue Pu measurements;  
occupational health; airborne contam-  
inants and protection.

Radiobiology . . . . . Pion radiotherapy; negative pion  
radiobiology with animals and cell  
systems; radiopharmaceutical tracers;  
plutonium carcinogenesis from "hot  
particles."

Toxicology . . . . . Acute and chronic toxicology;  
carcinogenesis and mutagenesis of  
oil-shale-associated materials.

## NATURAL RESOURCES AND EARTH SCIENCES

Geology and Geophysics . . . . . Ore genesis; geochemistry; seismology;  
rock mechanics; igneous geology;  
solid-earth geophysics; equation-of-  
state for geological materials; ion  
probe instrumentation; geophysical  
phenomena.

Mineral Industries . . . . . Performance of blasting agents;  
response of geological material to  
shockwaves and jets.

Natural Resource Surveys . . . . . Geothermal site selection; evaluation  
of geothermal reservoirs; uranium  
geochemical reconnaissance survey;  
analysis of satellite photos.

General. . . . . Atmospheric chemistry.

## NAVIGATION, GUIDANCE AND CONTROL

Control Devices and Equipment. . Tracking systems for solar eclipse  
experiments from airborne platforms.

## APPLICATION AREA

## EXPERTISE

### NUCLEAR SCIENCE AND TECHNOLOGY

- Fusion Devices (Thermonuclear) . Laser fusion: experimental, theoretical, systems studies, magnetic confinement fusion: theta pinch, Z pinch, systems studies; materials; environmental impact studies; tritium technology.
- Isotopes . . . . . Radioisotopes for medical applications; stable isotopes of carbon, nitrogen, oxygen and sulfur; laser isotope separation of U and Pu; radioisotopic heat sources ( $^{238}\text{Pu}$  compounds); spallation isotopes.
- Nuclear Auxiliary Power  
Systems. . . . . Space power reactors; design and materials technology for isotopic heat sources; radioisotopic thermoelectric generators; safety analysis and testing for space and terrestrial applications.
- Nuclear Explosions and Devices . Weapons diagnostics; testing explosive components; weapon effects; fireball chemistry; seismic detection; seismic monitoring of peaceful nuclear explosions; teleseismic verification of yield; earth electromagnetics and strain-tilt instrumentation.
- Nuclear Instrumentation. . . . . Calibration of radiation sources and instruments; design and development of a wide variety of detectors and instruments; low-energy X-ray facility; doped plastic scintillators; measurements of transuranic nuclide body burdens; environmental distribution of radionuclides.
- Radiation Shielding, Protection,  
Safety . . . . . Reactor safety: LWR, HTGR, LMFBR safety studies; neutronics analysis; hydrodynamic analysis; facilities for handling high-level gamma radiation.

## APPLICATION AREA

## EXPERTISE

### Radioactive Wastes and

Radioactivity. . . . . Processing, packaging, disposal and safety of transuranic wastes; radio-nuclide migration; laser photochemistry and waste processing.

### Reactor Engineering and Nuclear

Power Plants . . . . . Advanced reactor design studies: plasma core, heat-pipe cooling, very high temperature gas cooled reactor for process heat.

### Reactor Fuels and Fuel

Processing . . . . . Advanced LMFBR fuels; nondestructive and destructive examination of fuels; aqueous oxidation-reduction kinetics of actinide ions.

Reactor Materials. . . . . Handling; nondestructive and destructive examination; sodium handling and bonding for LMFBR fuel.

Reactor Physics. . . . . Neutron transport and dosimetry; generation and transmutation of isotopes; heavy ion accelerator experiments; atomic and nuclear data; cross section and polarization phenomena measurements with neutrons, protons, deuterons and tritons.

General. . . . . Reactor Safety: Experiments on criticality safety, application of nuclear diagnostics; Safeguards: nuclear process heat and applications; plutonium technology; nuclear processes as diagnostic tools; research with 8 MW reactor, 23 MeV Van de Graaff, 800 MeV proton linac.

## OCEAN TECHNOLOGY AND ENGINEERING

Dynamic Oceanography . . . . . Explosive-driven shockwaves and water-waves, upper and lower critical depth effects, etc.

## APPLICATION AREA

## EXPERTISE

### ORDNANCE

Ammunition, Explosives, and  
Pyrotechnics . . . . . Explosives in general; explosive  
testing and design; insensitive ex-  
plosives; initiation; hazards; shaped  
charges; fragmentation (especially  
household items); modeling; qualification  
of explosives, containment vessels,  
inert prematures; heavy-metal  
generators.

Armor. . . . . Modeling and design, testing.

Bombs. . . . . Modeling, small scale testing,  
containment vessels.

Detonations, Explosive Effects  
and Ballistics . . . . . Detonation theory, hazards, hydro-  
dynamic calculations, instrumentation  
(electrical, optical and X-ray),  
Hugoniot, performance, effects.

Rockets. . . . . Propellant hazards testing (SDT, DDT,  
etc.), hazards instrumentation,  
hazards modeling.

Underwater Ordnance. . . . . Explosives, shockwaves, jets, critical  
depth, bubble calculations.

General. . . . . Laboratory testing, new concepts.

### PHOTOGRAPHY AND RECORDING DEVICES

Photographic Techniques and  
Equipment. . . . . All speeds (especially ultra-high)  
photography (optical and X-ray);  
film, camera and lens design and  
fabrication (streak and framing);  
image intensifier design and  
fabrication, film sensitivity,  
densitometry, film interpretation  
and analysis, intense light sources,  
image digitization and enhancement,  
stereo (optical and X-ray); X-ray  
pinhole photography; X-ray streak  
cameras; infrared vidicons.

## APPLICATION AREA

## EXPERTISE

Recording Devices . . . . . Design of high-speed oscilloscope and digital time recording instrumentation.

Holography . . . . . Visible and infrared laser holography.

## PHYSICS

Acoustics . . . . . Sound speeds and attenuation applied to nondestructive testing; acousto-optic systems.

Fluid Mechanics . . . . . Efficient computational methods, numerical hydrodynamics, multi-dimensional flows; multiphase flows; fluid dynamics of chemically reacting systems; turbulent flow; statistical theory of fluid turbulence; shock phenomena.

Optics and Lasers . . . . . Infrared and ultraviolet gas and solid-state lasers, especially CO<sub>2</sub>; new laser R&D; laser system design and alignment; coherent antistokes raman scattering; laser interaction with solids; laser isotope separation; fission-product laser pumping; micromachining of optical elements; optical damage to materials; acousto-optic systems.

Solid State Physics . . . . . Surface and cluster theory; equation-of-state in plastic, fracture and high-pressure regions, laser-solids interaction; transport in semiconductors, liquids; electron emission; electronhole droplets; statistical theory of metals, semiconductors and insulators.

Plasma Physics . . . . . Mathematical, computational, experimental, diagnostics; laser-plasma interactions; transport properties; collective phenomena; plasma turbulence; equation-of-state; detonation plasmas; explosive-driven implosions.



## APPLICATION AREA

## EXPERTISE

- Radio Frequency Waves. . . . . Propagation and scattering in various media; detonation generation.
- General. . . . . Space Physics: Solar and geophysical phenomena; Accelerator Physics: All aspects; Nuclear Physics: Basic research in nuclear spectroscopy, reactions, fission process and yield; medium energy physics; high altitude physics; transport theory; quantum electrodynamics; statistical physics; theoretical molecular physics; molecular dynamics; statistical mechanics of many-body systems; phase transitions.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

- Energy . . . . . Socioeconomic assessments and data bases for Rocky Mountain resource utilization; cost-benefit analysis of proposed projects; mathematical analysis of input-output economic-ecologic regional energy models; energy resource modeling; design and development of energy-environment simulators.
- Environment. . . . . Assessment of health and environmental effects of plutonium.
- Transportation . . . . . Models for car pools, urban mass transit systems on hybrid computer.
- General. . . . . Cost-benefit analysis of proposed projects.

## TRANSPORTATION

- General. . . . . Explosion hazards.

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APPLICATION AREA

EXPERTISE

URBAN AND REGIONAL TECHNOLOGY AND  
DEVELOPMENT

Emergency Services and

Planning . . . . . Alarms and surveillance systems for  
plant facilities protection.

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Berkeley, California 94720

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Inventory Control. . . . . Computerized inventory control system.

Personnel Management, Labor  
Relations and Manpower  
Studies. . . . . Manpower requirements associated with  
energy resources.

ASTRONOMY AND ASTROPHYSICS

Cosmic Ray Research. . . . . Cosmic ray studies using high altitude  
balloons.

ATMOSPHERIC SCIENCES

Aeronomy . . . . . Effects of pollutants on ozone supply.

BIOMEDICAL TECHNOLOGY AND HUMAN  
FACTORS ENGINEERING

Biomedical Instrumentation and  
Bioengineering . . . . . Radiation cameras and tomographic  
scanners using radioisotopes;  
lipoprotein analyzer.

BUILDING INDUSTRY TECHNOLOGY

Architectural Design and  
Environmental Engineering. . . Computer program for analyzing energy  
efficiency of existing or proposed  
buildings; energy efficient lighting,  
heating, ventilation, air conditioning  
systems; solar heating and cooling;  
heat controlling filters for windows;  
energy conserving window shade designs;  
analytical and experimental thermal  
analysis of passive solar design.

## APPLICATION AREA

## EXPERTISE

### BUSINESS AND ECONOMICS

Domestic Commerce, Marketing  
and Economics. . . . . Census information and urban atlases;  
energy-economic models, forecasts of  
economic impacts of various energy  
scenarios.

### CHEMISTRY

Industrial Chemistry and  
Chemical Process  
Engineering. . . . . Coal liquification, gasification;  
stack gas purification; basic studies  
of catalysts; biomass conversion.

Basic and Synthetic Chemistry. . Inorganic/exotic compounds; Van der  
Waals molecules, molecular beam  
studies.

Photo and Radiation Chemistry. . Synthesis of elements and compounds in  
charged particle accelerators; isotope  
separation; ion implantation; mesonic  
chemistry, chemical reactions of heavy  
ions.

Physical and Theoretical  
Chemistry. . . . . Research in catalysis; thermodynamic  
and electrochemical cell research;  
crystal structure anomalies and radia-  
tion damage; electron spin resonance  
and proton spin resonance studies for  
determining crystal structure and  
energy levels; mathematical analysis;  
molecular structure; combustion  
chemistry.

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Accessories; networks.

Computer Software. . . . . Teleprocessing; data management;  
graphics; management information  
systems; networks.

## APPLICATION AREA

## EXPERTISE

### Control System and Control

Theory . . . . . Train control; instrument and accelerator control.

Pattern Recognition. . . . . Image processing; application to data analysis.

## ELECTROTECHNOLOGY

### Optoelectronic Devices and Systems. . . . .

Light emitting diodes; solar cells.

### Resistive, Capacitive and

Inductive Components . . . . . Superconducting magnets; printed coils, magnet design.

## ENERGY

Energy Use, Supply and Demand. . . . . Energy budgets, economic impacts, and impact multipliers for California and Rocky Mountain region; future studies.

Fuel Conversion Processes. . . . . Coal liquification and gasification, solar cells, photosynthesis; fusion; biomass.

### Policies, Regulations and

Studies. . . . . Economics; legal barriers to energy conservation in buildings; nuclear materials accounting, solar ownership and marketing.

Heating and Cooling Systems. . . . . Solar heating and cooling.

Fuels. . . . . Coal liquification and gasification; cellulose to alcohol conversion; molecular structure of coal; coal combustion.

Engine Studies . . . . . Basic studies of combustion in internal combustion engines.

Solar Energy . . . . . Heating and cooling controls; air conditioning; circumsolar radiation measurements; use of photosynthesis for

## APPLICATION AREA

## EXPERTISE

Solar Energy (contd) . . . . . hydrogen separation and for photo-electricity; bioconversion, California solar data; improved solar cells; solar ownership and marketing; radiative and passive cooling; analysis of passive solar buildings.

Miscellaneous Energy Conversion and Storage. . . . . Nitinol engine development.

Geothermal Energy. . . . . Field survey methods; subsidence; silica precipitation; National Geothermal Information Resource; geochemistry; magma; hydrodynamics; physical in-situ properties of rocks at high temperature and pressure; thermodynamics; nonelectrical uses.

Selected Studies in Nuclear Technology . . . . . Fusion power technology; laser isotope separation; neutral beam injectors; ion sources.

Environmental Studies. . . . . Environmental aspects of power generation; water impacts of in-situ oil shale technologies; effects of pollutants on membranes.

General. . . . . Energy conservation; appropriate technology; conservation education; manpower for conservation; fire research.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Air pollutants from power production; fundamental study of sulfur compound removal from stack gas; reactions in formation of aerosols; effects on plant life; instrumentation for measuring pollutants; ozone study.

Water Pollution and Control. . . . . Toxicity, fate and concentration of trace metals in marine environment; key ecosystem parameters; water impacts of in-situ oil shale technology; instrumentation for measuring pollutants.

## APPLICATION AREA

## EXPERTISE

Radiation Pollution and  
Control . . . . . Monitoring of gamma and X-rays, charged  
particles, neutrons; biological and  
environmental effects. Waste storage  
in granite; instrumentation.

Environmental Health and  
Safety. . . . . Effects of pollutants from power pro-  
duction on health; heavy metals effect  
on health; indoor air pollution; effects  
of radionuclides, ionizing radiation,  
magnetic and electric fields on health;  
population at risk to air pollution.

General . . . . . Survey of instruments for environmental  
monitoring.

## GOVERNMENT INVENTIONS FOR LICENSING

Chemistry. . . . . Bioconversion, stack gas cleanup.

Nuclear Technology . . . . . Ion sources.

Biology and Medicine . . . . . Radiation cameras; radioactive tracer.

Metallurgy . . . . . New steel alloys and treatment;  
superconductors.

Instruments. . . . . Trace heavy metal detector.

## HEALTH PLANNING

Community and Population  
Characteristics. . . . . Demographic information; epidemiology.

Environmental and Occupational  
Factors. . . . . Effects of energy production on health.

Health Care Technology . . . . . Development of an automated lipoprotein  
analyzer; radiation cameras and tomo-  
graphic scanners; nuclear medicine,  
heavy ion radiation therapy.

## APPLICATION AREA

## EXPERTISE

### INDUSTRIAL AND MECHANICAL ENGINEERING

Environmental Engineering. . . . Energy conserving lighting; passive  
light controls; solar air conditioning.

Manufacturing Processes and  
Materials Handling . . . . . Powder metallurgy.

### LIBRARY AND INFORMATION SERVICES

Information Systems. . . . . Networks; management information sys-  
tems; data base management; indexing;  
automatic indexing.

Retrospective and current awareness  
information retrieval; information  
system product pricing.

Reference Materials. . . . . Thesauri; thesaurus software.

### MATERIALS SCIENCES

Carbon and Graphite. . . . . Glassy carbon; study of graphite  
surface chemistry in combustion.

Ceramics, Refraction and  
Glass. . . . . Ceramic alloy research; microstructure  
relationship to properties; ferrites.

Corrosion and Corrosion  
Inhibition . . . . . Erosion-corrosion resistant alloys in  
coal combustion systems; erosion-  
corrosion test facility.

Iron and Iron Alloys . . . . . New high strength steels and heat  
treatment; steels for use at cryogenic  
temperatures; basic studies in powder  
metallurgy; nickel free cryogenic  
steels; study of fundamentals of alloy  
design, phase studies.

Nonferrous Metals and Alloys . . New magnetostrictive material; sintered  
printed circuit conductors; Nitinol  
research and applications.



## APPLICATION AREA

## EXPERTISE

### MATHEMATICAL SCIENCES

Algebra and Number Theory. . . .	Theory of equations and vector spaces.
Geometry . . . . .	Analysis of surfaces.
Operations Research. . . . .	Mathematical programming.
Statistical Analysis . . . . .	Economic statistics.
General. . . . .	General usage of mathematics in statistical data analysis.

### MEDICINE AND BIOLOGY

Biochemistry . . . . .	Basic studies of photosynthesis.
Clinical Chemistry . . . . .	Automated lipoprotein analysis.
Clinical Medicine. . . . .	Experimental treatment with heavy ions and alpha particles of acromegaly, pituitary, epilepsy, tumors, and other conditions; radiation cameras; diagnostic techniques with radionuclides; sickle cell anemia.
Cytology, Genetics and Molecular Biology. . . . .	Genetic studies in yeast; cytology fine structure; genetic hazards from energy production.
Ecology. . . . .	Ecosystem stability.
Electrophysiology. . . . .	Action of toxic molecules on neurons.
Pathology. . . . .	Studies of effects of radiation and pollutants on tissues and organs.
Public Health and Industrial Medicine . . . . .	Health effects of various pollutants associated with energy use and production.
Radiobiology . . . . .	Effects of electromagnetic and particle radiation on biological systems.

## APPLICATION AREA

## EXPERTISE

Stress Physiology. . . . . Effects of electric and magnetic fields.

## NATURAL RESOURCES AND EARTH SCIENCES

Geology and Geophysics . . . . . Geophysics associated with geothermal systems including survey methods, subsidence, evaluating reservoirs, modeling of rocks under stress; magma studies with potential geothermal applications; earthquake prediction.

Cartography. . . . . Computer production of maps showing demographic data.

## NUCLEAR SCIENCE AND TECHNOLOGY

Fusion Devices . . . . . Ion sources and neutral beam injectors; toroidal magnetic cusp confinement (TORMAC).

Isotopes . . . . . Separation and identification.

Nuclear Instrumentation. . . . . Complex detector, counter, and analyzer development.

Radiation Shielding, Protection and Safety . . . . . Shielding and protection systems for high energy charged particle accelerators.

## OCEAN TECHNOLOGY AND ENGINEERING

Biological Oceanology. . . . . Ecosystem stability indicators in estuarine environments.

General. . . . . Environmental effects of ocean thermal energy conversion processes.

## PHYSICS

Solid State Physics. . . . . Research in far-infrared spectroscopy, quantum mechanics, and superconductivity.

## APPLICATION AREA

## EXPERTISE

Plasma Physics . . . . .	Research and development fusion energy.
General. . . . .	Nuclear physics using high energy charged particle accelerators.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENT

Energy . . . . .	Conservation, geothermal, solar; regional energy studies.
Environment. . . . .	Compilation of descriptions of various commercial environmental monitoring instruments and data on various monitoring considerations; studies on effects of various pollutants.
General. . . . .	Census data available; computer production of demographic maps.

## TRANSPORTATION

Metropolitan Rail Transportation . . . . .	Investigation of control and safety related equipment for rail rapid transit (BART).
Road Transportation. . . . .	Study of electric highway transportation system.

## URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

Economic Studies . . . . .	Various studies for California and Rocky Mountain region related to employment and economic impacts of various energy scenarios.
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APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer. . . . . Management of R&D, small projects  
to large complex systems. Compre-  
hensive technology transfer program.

AERONAUTICS AND AERODYNAMICS

Aerodynamics. . . . . Aerodynamic behavior of bodies in  
large wind tunnels and in zero gravity.

Test Facilities and  
Equipment . . . . .

Design and operation of vacuum, cryo-  
genic, materials, engine, and power  
test facilities. Large wind tunnels  
and zero gravity facilities. Data  
collection systems.

BIOMEDICAL TECHNOLOGY AND  
ENGINEERING

Prosthetics and

Mechanical Organs . . . . . Advanced materials for prosthetic  
applications. Surface treatment of  
prosthetics materials with ion beams  
to promote tissue and bone adherence.

BUSINESS AND ECONOMICS

Minority Enterprises. . . . . Scientific and technical careers.  
Minority R&D enterprises.

CHEMISTRY

Analytical Chemistry. . . . . Instrumental analysis including mass  
spectroscopy, optical and x-ray  
emission spectroscopy, x-ray diffrac-  
tion, atomic absorption, spectro-  
photometry, and gas, ion, and liquid  
chromotography. Metallographic  
analysis (wet chemistry).

## APPLICATION AREA

## EXPERTISE

Basic and Synthetic Chemistry . . . . .	Synthesis, properties, and reactions of inorganic and organic compounds.
Industrial Chemistry and Chemical Process Engineering . . . . .	Transportation, handling, and storage of cryogenic fluids.
Photo and Radiation Chemistry . . . . .	Studies involving the interrelationships of electromagnetic or particle radiation and chemical reactions. Studies of radioactive elements and their reactions such as radio pharmaceuticals. Photovoltaic devices (solar cells).
Physical and Theoretical Chemistry . . . . .	Physical aspects and interpretation of chemical systems; reaction kinetics, chemical equilibria, chemical thermodynamics, thermochemistry, etc. Electrochemistry. Phase studies of metallic systems. Membranes. Surface chemistry.

## COMMUNICATION

Common Carrier and Satellite . . . . .	High power, high frequency amplifiers for communications satellites. Advanced satellite communications systems.
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## COMPUTERS, CONTROL AND INFORMATION THEORY

Control Systems and Control Theory . . . . .	Open and closed loop control systems.
Information Processing Standards . . . . .	Data acquisition and reduction for test installations.

## APPLICATION AREA

## EXPERTISE

- Fuel Conversion Process . . . . . Basic studies on heat transfer theory, principles and mechanisms. Advanced coal-fueled systems studies, once-through boiling, heat pipes, combustion process.
- General . . . . . Basic studies on gas turbine, rotating and reciprocating engines and components; hydrocarbon and hydrogen fuels.

## ENVIRONMENTAL POLLUTION AND CONTROL

- Air Pollution and Control . . . . . Airborne air quality and atmospheric condition monitoring systems. Some development and demonstration of advanced ground-based air quality monitoring techniques.
- Noise Pollution and Control . . . . . Research on propagation and reduction of aircraft engine noise.
- Radiation Pollution and Control . . . . . Radioactive contamination assessment and control.
- Environmental Health and Safety . . . . . Environmental contamination assessment and control.

## GOVERNMENT INVENTIONS FOR LICENSING

- General . . . . . Various, particularly as related to aircraft and spacecraft propulsion and electric power, satellite communications, and materials.

## INDUSTRIAL AND MECHANICAL ENGINEERING

- Quality Control and Reliability . . . . . Standards, plans, and techniques for insuring high quality and reliability. Failure analysis and information feedback.

## APPLICATION AREA

## EXPERTISE

### ELECTROTECHNOLOGY

- Antennas. . . . . Antenna theory and design, wide-band and narrow-band, for satellite and spacecraft communications systems.
- Circuits. . . . . Circuit theory, filters, amplifiers, power conditioning and supply circuits, signal conditioning circuits, commutators, logic circuits, switching circuits, phase locked loop circuits.
- Electromechanical Devices . . . . Relays, switches.
- Electron Tubes. . . . . Traveling wave tubes, Klystron tubes, thyristor tubes.
- Power and Signal  
Transmission Devices. . . . . Satellite and spacecraft communications terminals, wideband parametric amplifiers, analog and digital transmission devices, lasers, data relay systems.
- Resistive, Capacitive and  
Inductive Components. . . . . Capacitors, electromagnets.
- Semiconductor devices . . . . . Transistors, semiconductor diodes.

### ENERGY

- Energy Sources. . . . . Solar (photovoltaic), wind (large systems).
- Miscellaneous Energy  
Conversion and  
Storage . . . . . Gas turbine and compressors, topping cycles, Rankine, Brayton, and Stirling cycle engine systems, magnetohydrodynamic generation; solar photovoltaic; large wind power systems; high energy density batteries; fuel cells; reduction-oxidation (redox) storage systems.
- Energy Transmission . . . . . Superconducting materials.

## APPLICATION AREA

## EXPERTISE

- Tooling, Machinery and  
Tools . . . . . Gas turbines, compressors, pumps,  
gears, bearings, seals, pressure  
vessels, advanced materials. Lub-  
rication, friction, and wear.
- Manufacturing Processes  
and Materials Handling. . . . . Advanced materials application and  
fabrication. Handling and storage  
of cryogenic fluids, hydrogen, fuel  
and oxidizers. Sputtering and ion  
plating.
- Nondestructive Testing. . . . . Ultrasonic, radiographic, and other  
means for nondestructive evaluation.  
Electronic and optical systems for  
internal inspection of operating  
machinery.

## MATERIALS SCIENCES

- Ceramics, Refractories and  
Glass . . . . . Basic studies of ceramic materials  
for very high temperature applications.
- Composite Materials . . . . . Comprehensive research and develop-  
ment on essentially all classes of  
composite materials, their properties,  
characteristics, and applications.
- Corrosion and Corrosion  
Inhibition. . . . . Research on high temperature environ-  
ment corrosion and corrosion inhibit-  
ing coatings, high temperature oxida-  
tion and oxidation resistant coatings.
- Iron and Iron Alloys. . . . . Basic studies of physical properties  
to extend uses at cryogenic tempera-  
ture.
- Lubricants and Hydraulic  
Fluids. . . . . Research and development of advanced  
lubricants and hydraulic fluids for  
severe operating conditions and long  
life.



## APPLICATION AREA

## EXPERTISE

### Nonferrous Metals and

Alloys. . . . . Research and development for high temperature and gas turbine applications. Superalloys. Dispersion strengthened materials. Eutectics.

Plastics. . . . . (see Polymer Chemistry)

### Refractory Metals and

Alloys. . . . . Research on microstructure, physical and mechanical properties, alloying for high temperature use. Improvement in fabrication properties and processes.

## MEDICINE AND BIOLOGY

Radiobiology. . . . . Preparation of experimental radioactive isotopes for diagnosis and treatment of diseases for U.S. Public Health Service.

## NATURAL RESOURCES

### Natural Resource

Surveys . . . . . Airborne multispectral scanning to determine earth surface conditions.

### Snow, Ice, and

Permafrost. . . . . Aircraft and satellite-borne sensor systems to determine the thickness and kinds of ice covering large bodies of water.

## PHOTOGRAPHY AND RECORDING DEVICES

Holography. . . . . Development of holography techniques.

### Photographic Techniques

and Equipment . . . . . Development of high-speed motion picture systems and other techniques for photographing research work.

## APPLICATION AREA

## EXPERTISE

### PHYSICS-

- Acoustics . . . . . Research on the nature, properties, propagation, and suppression of sound in ducts. Applications to aircraft engines.
- Fluid Mechanics . . . . . Research and applications of fluid properties, and static and dynamic behavior; and of interactions between fluids and solid bodies.
- Optics and Lasers . . . . . Research on lasers, and applications of fiber optics and other optical devices for instrumentation and data-taking purposes.
- Solid State Physics . . . . . Research on physical properties of materials particularly as related to magnetism and superconductivity. Semiconductor studies particularly as related to photovoltaic devices.
- Structural Mechanics. . . . . Stress analysis, shock and vibration research, particularly as related to properties of advanced materials and rotating machinery. Fracture mechanics. Fatigue failure mechanisms.
- Plasma Physics. . . . . High temperature plasma research for advanced power and propulsion systems.

### PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

- Energy. . . . . Airborne thermal imaging of ground facilities to identify places of heat loss.
- Environment . . . . . Techniques for identifying airborne contaminants and locating their sources.

APPLICATION AREA

EXPERTISE

TRANSPORTATION

Surface Transportation. . . . . Electric vehicle studies and power plant development. Automotive gas turbine and Stirling-cycle engines. Technology for increasing fuel efficiency and reducing exhaust emissions.

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NASA Lewis Research Center  
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Cleveland, Ohio 44135  
Telephone: (216) 433-4000, ext 6832

LAWRENCE LIVERMORE LABORATORY  
 Livermore, California 94550

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ADMINISTRATION</u> . . . . .	Human resource data base development; technology transfer and training program.
<u>ASTRONOMY AND ASTROPHYSICS</u> . . . . .	Physical property measurements of terrestrial and extraterrestrial rocks and minerals at high temperatures and pressures; soft X-ray instrumentation analytical and computer modeling; rocket astronomy.
<u>ATMOSPHERIC SCIENCES</u> . . . . .	Instrumentation; regional air quality modeling; analytical and computer modeling site surveys; satellite ozone analysis and radiative transfer computations.
<u>BEHAVIOR AND SOCIETY</u> . . . . .	Technology transfer training program, continuing education program and career development program.
<u>BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS.</u> . . . . .	Chromosome analysis measurement and sorting techniques; computer automation for biomedical research.
<u>CHEMISTRY.</u> . . . . .	Electron paramagnetic resonance spectroscopy; scanning electron microscopy; nuclear magnetic resonance spectroscopy; gas chromatography; x-ray diffraction; polorgraphy; electrochemistry; automated analysis; thermochemistry; in situ coal gasification studies; shale oil retorting studies; laser isotope separation; particulate analysis; surface chemistry.
<u>CIVIL ENGINEERING.</u> . . . . .	P-V relationships of rocks and minerals; scanning electron microscopy; fracturing; modeling of coal mine pillar structures; earthquake-proof design.

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>COMMUNICATION.</u> . . . . .	Stability of coders for industrial television; industrial television monitor display systems; use of micro-computers in communication theory; laser communication systems.
<u>COMPUTERS, CONTROL AND INFORMATION THEORY</u> . . . . .	Programming, data base acquisition and retrieval systems; pattern recognition techniques; interactive graphics; pattern recognition techniques.
<u>DETECTION AND COUNTERMEASURES.</u> . . . . .	Systems analysis and modeling of explosive detection and countermeasure techniques.
<u>ELECTROTECHNOLOGY.</u> . . . . .	Computer modeling and electromagnetic analysis of antenna design; inspection of IC photomasks; electro-optical scanner for monitoring electron beam welds; design of ultrafast Pockels cell devices and modulators; high power laser amplifiers; high power laser systems; semiconductor detector fabrication techniques and evaluation studies; design of microcircuits and unique chips; photovoltaic cells applications.
<u>ENERGY</u> . . . . .	Planning, forecasting, and resource assessment studies; high power laser fusion; magnetic fusion R&D; biofuel production schemes; solar heating and cooling studies; alternative fuels and alternative engine evaluation; transportation modeling; geothermal energy R&D; in situ coal gasification; oil-shale retorting; photovoltaic materials development.
<u>ENVIRONMENTAL POLLUTION AND CONTROL.</u> . . . . .	Trace element detection and analysis; techniques for detecting and analyzing mutagens and carcinogens; particulate detection and analysis; air quality modeling studies; meteorological data acquisition; instrumentation and systems development; stack monitoring.

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## APPLICATION AREA

## EXPERTISE

### INDUSTRIAL AND MECHANICAL ENGINEERING. . . . . .

Metric conversion planning, precision machining and polishing; non-destructive testing of microtargets for laser fusion; acoustic emission for nondestructive testing applications.

### LIBRARY AND INFORMATION SERVICES . . . . .

Novel techniques for information storage and rapid retrieval systems; master control computer program; on-line literature searching; computer program for integrating tests and data.

### MATERIALS SCIENCES . . . . .

Development of metals and alloys having special properties; fabrication of specialized ceramic components; synthesis, formulation and characterization of polymers and fiber composites; synthesis, formulation, processing, machining; processing and fabrication of beryllium glasses; storage behavior of hydrogen and its isotopes under extremes of pressure and temperature and solid state chemistry; new materials and fabrication processed by vapor deposition techniques; coatings, structures and electronic devices by thin-film technology; electroplating and electroforming of shapes and materials; crystal growth of large silicon and germanium crystals; joining technology; physical and mechanical testing at the extremes of temperature and pressure; surface microstructure analysis; equation-of-state studies; radiation effects on structural materials; fabrication of amorphous alloy glass components.

### MATHEMATICAL SCIENCES. . . . . .

Sensitivity analysis of ordinary differential equation systems subroutines to evaluate mathematical functions; applied and computational mathematics; computer algorithms for transposing large matrices.

## APPLICATION AREA

## EXPERTISE

- MEDICINE AND BIOLOGY . . . . . Screening of chemotherapeutic agents using pattern recognition techniques; biological effects of nuclear explosions.
- NATURAL RESOURCES AND EARTH SCIENCES . . . . . Seismic analysis of resistant structures and power reactors; seismic detection and instrumentation; in situ coal gasification; shale oil retorting.
- NUCLEAR SCIENCE AND TECHNOLOGY . . . . . Energy level computations and measurements; nuclear electric moments; gigajoule laser technology; management of nuclear wastes.
- PHOTOGRAPHY. . . . . Optics of ultra-high-speed photography; picosecond photography of laser produced plasmas; ultrafast optical/X-ray framing camera; high voltage photography, industrial photography.
- PHYSICS. . . . . Computations; geophysical investigations of terrestrial material properties; geophysical instrumentation and measurements.
- PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS. . . . . Fire-arson and disaster control planning; fire hydraulic; residential and industrial fire protection studies; fire protection equipment development - streams, nozzles, hydrants, hydraulic hardware; State and local government assistance in energy planning and analysis; technology transfer to State and local governments; transportation modeling of street and highway systems.

### CONTACT:

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MEDICAL DEVICES LABORATORY  
Silver Spring, Maryland 20910

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING</u>	
Prosthetics and Mechanical Organs . . . . .	Performance Standards and Test Methods evaluation and develop- ment for metallic and polymeric implant devices.
Biomedical Instrumentation and Bioengineering . . . . .	Performance Standards and Test Methods evaluation and develop- ment for Diagnostic, Therapeutic and Surgical devices.
<u>HEALTH PLANNING</u>	
Legislation and Regulations . . . . .	Federal Regulatory requirements for Medical Devices and Diagnostic Products.
<u>MEDICINE AND BIOLOGY</u>	
Clinical Chemistry . . . . .	Performance Standards and Test Methods evaluation and develop- ment for Clinical Chemistry products using spectrophotometry, flame photometry, atomic absorption (Flame and graphite furnace), Spectrophotometry electrophoresis, osmometry, chloridometry.
Immunology . . . . .	Performance Standards, Test and evaluation of diagnostic immuno- logic products using radio- immunassay (gamma), electrophoresis, immuno-electrophoresis, immuno- diffusion, fluorescent antibody measurements, complement fixation and agglutination reactions.



APPLICATION AREA

EXPERTISE

Hematology . . . . .	Performance Standards, test development and evaluation of hematology products using blood cell count and indices, cell morphology, and differentials, platelet counts (microscopy), fibrometer determination of coagulation parameters such as prothrombin time (PT) and partial thromboplastin time (PPT).
Microbiology . . . . .	Performance Standards and Test Methods development and evaluation for microbiologic and tissue culture media, antibiotic sensitivity testing, sterility.

CONTACT:  
Edward Mueller  
Food and Drug Administration  
Medical Devices Laboratory  
8757 Georgia Avenue  
Silver Spring, MD 20910  
Telephone: (202) 447-2468

MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND  
Fort Belvoir, Virginia 22060

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration and Technology Transfer. . . .	Research and development planning and management; contract management; identification of technical problem areas and research needs; Technology Transfer.
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BUILDING INDUSTRY TECHNOLOGY

Structural Analysis. . . . .	Test and evaluation of structural integrity and load carrying capability of bridges, prefabricated buildings, towers and ancillary equipment. Dy- namic and static data acquisition and conversion to practical engineering information.
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Mobil Stress Analysis Van; A/D Strain  
Data Input Control and Recording  
System accomodates up to 250 data  
channels and enables instant on-the-  
site-data analysis and print-out.  
Portable data acquisition systems also  
available.

Construction Materials, Components and Equipment . . .	Environmental equipment technology and total environmental control systems for mobile shelters and vans. Indus- trial wastewater renovation; water treatment and pollution control tech- nology; general purpose lighting, high power search lights.
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CHEMISTRY

Analytical Chemistry . . . . .	Chemical analyses of metals, glasses, organic and inorganic materials. Emis- sion Spectrometer/Spectrophotometers, Scanning Electron Microscope, Particle Counters, Gas Chromatograph, Liquid Chromatograph, etc.
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## APPLICATION AREA

## EXPERTISE

- Polymer Chemistry. . . . . Polymer research and development includes pressure polymerization and Ziegler Catalysis; characterization of polymers by molecular weight, chemical, physical and electrical properties.
- Physical and Theoretical Chemistry. . . . . Research in electrochemistry using gas chromatograph-mass spectrometer tandem unit; surface research on phenomena such as catalysis and corrosion by low energy electron diffraction (LEE), reflecting high energy electron diffraction, secondary electron spectroscopy and mass spectrometry; trace gas detection technology emphasizing plasma chromatography and enzymatic methods.

## CIVIL ENGINEERING

- Civil Engineering. . . . . Water and waste management and pollution abatement. Complete chemical, physical, radiological and bacteriological analyses. Specialized equipment for the evaluation of water purification systems including the effectiveness of reverse osmosis and ultrafiltration membranes. Outdoor testing of water purification and sewage treatment systems; sewage treatment for crane barge.
- Construction Equipment, Materials and Supplies . . . . . Specification and evaluation of construction, earthmoving, clearing and highway maintenance equipment. Extensive test facilities including high speed operations; vehicle road endurance; service brake tests; vehicle drawbar and drag test, drive-by sound level measurement; cross-country stability tests, hydraulic components test, etc. A special "wading pond" is designed to provide water at controlled depth up to 6 feet.
- State-of-the-art equipment for measuring and analyzing exhaust emissions.

## APPLICATION AREA

## EXPERTISE

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Software. . . . . Programming.

### DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . . Intrusion detection; noise monitoring.

Infrared and Ultraviolet  
Detection. . . . . Intrusion detection by: passive  
scanning IR and passive IR motion  
sensors.

Magnetic Detection . . . . . Active and passive techniques for  
intrusion and metal detection  
applications.

Personnel Detection. . . . . Intrusion detection by acoustic,  
seismic, magnetic, electromagnetic  
and optical devices. Fully inte-  
grated systems featuring remote  
monitoring and interrogation.

Radio Frequency Detection. . . . . Soil penetrating radars; microwave  
detectors of subsoil features; tunnel  
detection; non-linear radar for spe-  
cial applications. In-door facility  
for radar cross section and imaging  
measurements.

Seismic Detection. . . . . Detection and classification of  
intruders.

### ELECTROTECHNOLOGY

Antennas . . . . . Design/evaluation of special purpose  
antennas; interactive computer program  
for pattern calculations; anechoic  
chamber (200 MHz and higher).

Circuits . . . . . Microwave network analyzer, micropro-  
cessor test and analysis facility;  
microcomputer programming and hardware  
development. Customized electric power  
supplies power conditioners; Thyristor  
test facility; CAD-E skills and comp-  
uter facilities.

## APPLICATION AREA

## EXPERTISE

Electromechanical Devices. . . . Electric generators and propulsion systems.

Power and Signal Transmission  
Devices. . . . . Electric power transmission and distribution for quick reaction field applications.

Semiconductor Devices. . . . . Cooling of high power semiconductors by heat pipe technique. Advantageous for applications in electrochemical plating and metals refining; induction heating; power conditioning, motor speed controls; vehicular drives; welding controls.

General. . . . . Lighting technology/equipment.

## ENERGY

Electric Power Transmission. . . Electric power transmission and distribution for quick reaction applications such as construction sites, airfield, emergencies, etc.

Fuel Conversion Processes. . . . Conversion of crude oil to emergency fuel for compression-ignition engines; generation of hydrogen from hydrocarbons.

Electric Power Production. . . . Solar Photovoltaic applications; fuel cells, batteries, electric generators.

Heating and Cooling Systems. . . Solar heating; air conditioner power by engine exhaust gases.

Fuels. . . . . Alternate fuels and lubricants for internal combustion engines; long life engine oils; re-refined engine oils.

Engine Studies  
(Energy Related) . . . . . Gas turbine technology for power range of 10 to 250 kW. See also under "Fuels" above.

Internal combustion engine technology.

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## APPLICATION AREA

## EXPERTISE

- Batteries and Components . . . . . Evaluation of new battery systems for propulsion systems; development of fuel cell technology; hybrid fuel cell/battery power sources.
- Solar Energy . . . . . Solar photovoltaic and thermal energy sources. Application studies.
- Miscellaneous Energy Conversion and Storage. . . . . Energy storage flywheels; electric drivers; solid state power conditioners and components; electrothermal energy conversion.

## ENVIRONMENTAL POLLUTION AND CONTROL

- Air Pollution and Control. . . . . Analysis of exhaust gas emissions from all types of fuel burning equipment. Establishment of pollutant levels and evaluation of pollution control devices and techniques. See also "Radiation Pollution Control".
- Noise Pollution and Control. . . . . Drive-by sound level measurement; simulated free field sound chamber to eliminate fluctuating ambient noise levels.
- Retrofit noise abatement kits for mobile construction, materials handling and power generation equipment.
- Expertise in the identification of noise source.
- Water Pollution and Control. . . . . Water purification/desalination; complete chemical, physical, radiological and bacteriological analyses; reverse osmosis and ultrafiltration membranes. Outdoor testing of water purification and sewage treatment systems.
- Radiation Pollution Control. . . . . Complete radioactive analysis, including alpha, beta, gamma, X-ray and neutron measurements. Airborne concentrations are measured directly or via particulate collection.

## APPLICATION AREA

## EXPERTISE

### GOVERNMENT INVENTIONS FOR LICENSING

General. . . . . Requests for license under patents should be addressed to: Chief, Patents Division, Office of the Judge Advocate General, Department of the Army, Washington, DC 20310.

Requests should be submitted together with the proposed terms of the license.

### INDUSTRIAL AND MECHANICAL ENGINEERING

Quality Control and Reliability. . . . . Simulated environments; shock, vibration and road tests; electromagnetic interference evaluation; quality control of soldered connections; mobile dynamometer analysis (reserve tractive effort); reliability, maintainability and quality engineering. Weld procedures and certification. Technical review of materials specifications.

Tooling, Machinery and Tools . . Materials Handling Equipment (MHE) such as cargo containers; airfilm loading systems; safety devices for MHE; forklift trucks; container identification and control systems; refrigerated containers. Design of packaging systems. Air conditioning, heating and lighting.

Industrial Safety Engineering. . Load indicating device systems for cranes, rollover protective structures.

Health physics radiation protection (lasers, X-rays, radioactive materials, microwaves).

Hydraulic and Pneumatic Equipment. . . . . Development of specifications; state-of-the-art consulting; noise reduction; contaminant sensitivity evaluation; hydraulic system tests; fire resistant hydraulic fluids.

## APPLICATION AREA

## EXPERTISE

Nondestructive Testing . . . . . Nondestructive testing of metallic materials; X-ray, hardness, magnetic particle and dye penetrant.

## MATERIALS SCIENCE

Ceramics, Refractories and  
Glass. . . . . Ceramic products analysis

Coatings, Colorants and  
Finishes . . . . . Electroplated coatings; anodizing; conversion coating; research and development of paints and coatings to meet special performance characteristics; chemical analyses of paints and coatings; cleaners and paint removers; coatings for fabrics; spectral and specular reflectance measurements.

Composite Materials. . . . . Test, evaluation and development of composite materials including intercalated graphite compounds.

Corrosion and Corrosion  
Inhibition . . . . . Corrosion studies of metals and alloys. Consulting services in general metallurgy, welding, foundry, corrosion metals and alloy selection, failure analysis.

Elastomers . . . . . Compound development for rubber items; mechanical and physical testing of rubber, coated fabrics and adhesives; chemical and environmental evaluation; processing and fabrication of rubber prototypes. Conformance testing to ASTM, SAE and Federal specifications.

Fibers and Textiles. . . . . Mechanical and physical testing of fibers and textiles. Flammability studies, color, spectral and specular reflectance properties.

Lubricants and Hydraulic  
Fluids . . . . . Analysis and evaluation of fuels, lubricants, power transmission and hydraulic fluids, corrosion preventives and specialty compounds. Flame/fire resistant additives.



## APPLICATION AREA

## EXPERTISE

### Materials Degradation and

Fouling. . . . . Expertise in reverse osmosis and ultrafiltration membrane technology; identification of fungal infiltration; investigation of environmental and biodeterioration of materials; tropical chamber tests; failure analyses of metallic materials.

### Solvents, Cleaners and

Abrasives. . . . . Chemical cleaners and paint removers.

### Wood and Paper Products. . . . .

Paper technology; preparation of paper, test and evaluation.

## PHYSICS

Acoustics. . . . . Transmission of sound through enclosures and through the soil; geophones; signature analysis.

Structural Mechanics . . . . . Mechanical testing; tension and compression, impact, fatigue and creep. (See also "Building Industry Technology Structural Analysis".)

Radio Frequency Waves. . . . . Near field antennas; radiation into the ground; radar scattering cross-section measurements.

General. . . . . Professional expertise available for consultation in variety of specialized fields.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

### Police, Fire, and Emergency

Services . . . . . Physical security systems design and evaluation (exterior and interior); security system site survey; detection of explosives, mail bombs, buried objects, underground tunnels and caves. POL identification kit to provide for rapid determination if suspected fuel has been stolen.

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## APPLICATION AREA

## EXPERTISE

Energy . . . . . Energy programs related to private sector use. (Details under "Energy" above.)

Environment. . . . . Water treatment and waste water renovation; pollution control technology involving air, water, noise and radiation. For details refer to "Environmental Pollution and Control" above.

Transportation . . . . . Dynamic testing of railway cars; computer modeling of beach mobility of construction equipment; amphibian and air cushion vehicle technology; marine propulsion systems; bridge design; multi-purpose cargo containers and container identification systems.

## TRANSPORTATION

Transportation Safety. . . . . Rollover protective device design; load indicating device systems for cranes.

Pipeline Transportation. . . . . Liquid fuels handling technology, including pipeline construction technology, materials, joining techniques, fuel decontamination and fuel dispensing equipment as well as fuel additives to reduce pipeline friction. POL identification kit.

Marine and Waterway  
Transportation . . . . . Coastal shipping, docking/undocking large ships in harbors and ship-to-shore lighters for the transfer of cargo to the beach; amphibian and air cushion vehicle technology; bridge design; bridge launching and retrieving mechanisms; marine electronics communication and navigation/self-contained underwater breathing (SCUBA) equipment.

Railroad Transportation. . . . . State-of-the-art improvements on existing railway equipment; development of special purpose cars such as a 300 ton heavy duty flat car with hydraulic high impact cushioning.

APPLICATION AREA

EXPERTISE

URBAN AND REGIONAL TECHNOLOGY  
DEVELOPMENT

Environmental Management and  
Planning . . . . . Refer to corresponding paragraphs  
under "Problem Solving Information  
for State and Local Governments".

Fire Services, Law Enforcement  
and Criminal Justice . . . . . Refer to corresponding paragraphs  
under "Problem Solving Information  
for State and Local Governments".

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Autovon: 354-4970/3330

NAVAL AIR DEVELOPMENT CENTER  
Warminster, Pennsylvania

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ADMINISTRATIVE</u>	
Management Information Systems. . . . .	PTS (Project Tracking System) implemented for major systems projects.
Personnel Management, Labor Relations and Manpower Studies. . . . .	Personnel evaluation resource and workload analysis, project management training source.
Research Program Administration and Technology Transfer. . . .	R&D administration, technology transfer program.
<u>AERONAUTICS AND AERODYNAMICS</u>	
Aerodynamics . . . . .	Aerodynamic forces and movements, airloads, air vehicle performance, store separation, aerodynamics research. Analysis of performance, stability, aerodynamic loads. Aerothermodynamics, structures including finite element analysis.
Aeronautics. . . . .	Flight testing. Fatigue life assessment of all Navy fighter A/C. Flight and ground load surveys - equipment and instrumentation. Aircraft flight control and instrumentation systems. Installation, design, engineering shops. Flight dynamics, stability and control, flying qualities, simulation, exploratory development. Aircraft modification certification, quality control, flight safety inspection.
Aircraft . . . . .	Conceptual design, configuration trades and optimization, sensitivity to mission and payload, propulsion-induced forces and moments. Full scale structural test facility for static and fatigue tests of complete

## APPLICATION AREA

## EXPERTISE

Aircraft (Contd) . . . . . airframe including instrumentation loading equipment and closed loop automatic controls. Vibration, shock and environmental fatigue test facility. Preliminary design. Advanced aircraft concept formulation studies and analyses.

Parachutes and Decelerators. . . Management control of R and D; casualty investigation as applied to ASW expendables sonobuoys, BT. Wts. 8 pounds to 600 pounds. Design, theory and testing of deployable aerodynamic decelerators.

Avionics . . . . . System integration, aircraft integration. Displays, computers, system integration design and development. Circuit design, black box development/system design. System design, avionics subsystem integration. Basic avionics technology development.

Test Facilities and Equipment. . . . . Environmental test facilities Oreland Deep Water Facility for test of Acoustic Transducers Tank facilities and transducer test facilities at NADC. Outdoor antenna range, anechoic chambers.

## ASTRONOMY AND ASTROPHYSICS

Astrophysics . . . . . Centrifuge simulation of human tolerance and performance under space vehicle acceleration and deceleration for NASA.

## ATMOSPHERIC SCIENCES

Meteorological Data Collection, Analysis, and Weather Forecasting. . . . . Meteorological and refraction sondes and related data processing.

## APPLICATION AREA

## EXPERTISE

### BEHAVIOR AND SOCIETY

#### Job Training and Career

Development. . . . . In-service education by job-rotation assignments and specialized short/long-term complementary education and technical/managerial training. Integrated program development through extended time/performance monitoring and managerial assessment for optimum selection of candidates.

Psychology . . . . . Military/industrial applications through research, design, development and evaluation of aviation-oriented man-machine systems.

### BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS

Human Factors Engineering. . . . . Systems approach to selection and training of personnel for operation and maintenance of equipment of systems. Operator-oriented design of equipment and work spaces, design of cockpits. Technologies for operator task-loading assessment and evaluation in complex man-machine systems, including computer modeling and simulation.

Life Support Systems . . . . . Protection for aviators against normal and induced hazards throughout mission profile; oxygen breathing systems; restraint systems including crash activated inflatable restraints; crash-worthy energy absorbing/dissipating seating; protective helmets and communication systems; personal and group emergency flotation systems, fire-resistant uniforms and habiliments high-acceleration tolerance systems, ejection-seating systems; survival, detection and acquisition systems for the post-emergency environment sequence; advanced design concepts for

## APPLICATION AREA

## EXPERTISE

### Life Support Systems

(Contd). . . . . emerging and future high-performance vehicles; protection systems for crews and troops in high-performance amphibious craft. In-house research design, development and test facilities; dynamic flight simulation in world's most advanced human centrifuge.

## CHEMISTRY

Analytical Chemistry . . . . . Complete facilities for instrumental and wet chemical analyses of engineering materials.

Polymer Chemistry. . . . . Elastomeric compounding.

Photo and Radiation Chemistry. . Radio tracer chemical analysis.

General. . . . . General chemical laboratory facilities.

## COMMUNICATION

Common Carrier and Satellite . . Design, development, test and application of aircraft. Radio communications equipment and systems.

Graphics . . . . . Via instrumentation display design.

Verbal . . . . . Via helmet systems.

### Communication and Information

Theory . . . . . Design, development, test and application of aircraft. Radio communications equipment and systems.

General. . . . . Design, development, test and application of aircraft. Radio communications equipment and systems.

## COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Aircraft computer design/integration; sub-system computer design for signal processing applications. Design, development, test and evaluation.

## APPLICATION AREA

## EXPERTISE

Computer Software. . . . .	Design, development, test and evaluation. Application Programming, systems programming, Data Base Design Software design for large-scale system control applications; sub-system soft-ware/firmware design/integration. Soft-ware life-cycle support for a variety of operational aircraft.
Control Systems and Control Theory . . . . .	Automatic stabilization systems. Flight control systems.
General. . . . .	Dynamic simulation of aircraft and other vehicular environments via human centrifuge, etc.

## DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . .	Acoustic signal data processing; computer algorithm development; acoustic intelligence gathering Design and development of Naval acoustic detection systems both active and passive. Experience in both under water and air acoustic detection systems. Acoustic sensors, ocean measurements, modeling, analysis sonobuoy systems.
Electromagnetic and Acoustic Countermeasures. . . . .	Circuit design, black box development/system design. ECM, Airborne ASW tactics. Acoustic sensors, ocean measurements, modeling, analysis sonobuoy systems. Aircraft radar cross-section reduction.
Infrared and Ultraviolet Detection. . . . .	Development of infrared imaging devices. Development of aerial infrared flash systems.
Magnetic Detection . . . . .	Development of airborne magnetometers for submarine detection.



## APPLICATION AREA

## EXPERTISE

Optical Detection. . . . .	Development of laser radar. Development of long focal length lens systems.
Personnel Detection. . . . .	Infrared intrusion alarm. Seismic detector. Television base perimeter defense.
Radio Frequency Detection. . . .	Radar systems design. Passive systems design.
General. . . . .	Non-acoustic detection of submarines.

## ELECTROTECHNOLOGY

Antennas . . . . .	Applications for command control and telemetry. Design, theory, and on-aircraft pattern predictions, etc.
Circuits . . . . .	Analysis, design. Theory and analysis. Analysis and design for displays, controls and processing.
Electromechanical Devices. . . .	Antenna and Rotodome engineering. Hydromechanical branch designs and develops devices required for use in airborne acoustic systems. Design, theory and application.
Optoelectronic Devices and Systems. . . . .	Development of airborne infrared line scanners, forward looking infrared (FLIR) devices, low light level television, active range gated television, image intensifiers, charge transfer devices. Development of lens environmental compensation system.

## ENERGY

Energy Use, Supply and Demand . . . . .	Collects and analyzes data on fuel use by Naval aircraft. Selects certain Navy aircraft for fuel conservation studies.
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## APPLICATION AREA

## EXPERTISE

Electric Power Production. . . .	Aircraft power generation, control and distribution.
Fuels. . . . .	Plans in conjunction with NAPTC programs to obtain aircraft fuels from alternate crude oils, tar sands, coal and oil shale.
Engine Studies (Energy Related) . . . . .	Gas turbine engine performance, engine installation (inlets, diffusers, nozzles), simulation, augmentors.
Batteries and Components . . . .	Aircraft Batteries. Battery Power sources required for expendable ASW system components.
General. . . . .	Conducts studies on the application of technologies to Naval aircraft to bring about fuel conservation. Conducts analysis of competing future aircraft candidates to determine relative energy/fuel use. Infrared (thermal) mapping of urban areas to detect heat losses from buildings.

## ENVIRONMENTAL POLLUTION AND CONTROL

Water Pollution and Control. . .	Use of airborne infrared line scanner to detect stream pollutants. Ion exchange systems, reclamation of solvents and paint strippers. Design and development of integrated airborne sensor systems.
Environmental Health and Safety . . . . .	OBOGS (On-board oxygen generation systems) for aircraft from ambient atmosphere.
General. . . . .	Non-polluting cleaners and plating baths.

## APPLICATION AREA

## EXPERTISE

### GOVERNMENT INVENTIONS FOR LICENSING

Mechanical Devices and  
Equipment. . . . . Miniboats-replacement for one-man  
life rafts, smaller stored weight  
and volume, more stable in wind and  
sea, for open-water survival and  
recreation. Electro-Servo anti-g  
valves-optimum response to accelera-  
tion forces.

### HEALTH PLANNING

Environmental and Occupational  
Factors. . . . . In aircraft and other high-stress  
vehicles, also high stress areas in  
ship-board control centers.

### INDUSTRIAL AND MECHANICAL ENGINEERING

Job Environment. . . . . In aircraft and other high-stress  
vehicles including amphibious  
landing craft.

Environmental Engineering. . . . . In cockpits, ASW data processing  
centers, etc.

Industrial Safety Engineering. . . . . For aircraft.

Hydraulic and Pneumatic  
Equipment. . . . . Aircraft hydraulic power systems,  
actuation systems, contamination  
control, hydraulic diagnostics.

Nondestructive Testing . . . . . Acoustic emission, ultrasonic, eddy  
current, etc.

General. . . . . Plain airframe bearings.

### LIBRARY AND INFORMATION SCIENCES

Information Systems. . . . . Computer and library information  
systems such as National Technical  
Information System, Defense

## APPLICATION AREA

## EXPERTISE

### Information Systems

(Contd). . . . . Documentation Center, Smithsonian  
Science Information Exchange,  
Federal Assistance Program Retrieval  
System.

Reference Material . . . . . Library.

## MATERIALS SCIENCES

Adhesives and Sealants . . . . . Aircraft structural adhesives,  
structural and fuel tank sealants.

Coatings, Colorants, and  
Finishes . . . . . Aircraft coatings - metallic, organic,  
intumescent and countermeasure  
coatings.

Composite Materials. . . . . Organic matrix, metal matrix and  
high temperatures. Testing to  
determine data base and environmental  
effects. Environmental effects  
data base and NDT of G/E laminates  
design of composite aircraft primary  
structure (wings and fuselage).  
Laminate analysis. Orthotropic  
finite element stress, vibration,  
aeroelastic analysis.

### Corrosion and Corrosion

Inhibition . . . . . Atmospheric corrosion inhibitors and  
preservative compounds for airframe  
and avionics. Vapor phase inhibitors.  
Corrosion and embrittlement research.  
Corrosion and embrittlement detection  
methods.

Elastomers . . . . . Airframe and fuel cell sealants,  
sealants for missiles and sonobuoys.

Fibers and Textiles. . . . . Materials for LTA (lighter than air)  
vehicles.

### Lubricants and Hydraulic

Fluids . . . . . Solid lubricants, fire resistants,  
hydraulic fluids, tribology.

## APPLICATION AREA

## EXPERTISE

Materials Degradation and Fouling. . . . .	Data base for graphite-epoxy composite degradation in aircraft environments. Theory and prevention of aging of organic compounds and coatings.
Miscellaneous Materials. . . . .	Standardization, major systems program support, quality assurance, Failure analysis. Coating material.
Plastics . . . . .	Organic matrix structural laminates. Radome and leading edge designs.
Refractory Metals and Alloys . .	Coatings and directional solidification of eutectic alloys.
Solvents, Cleaners, and Abrasives. . . . .	Aircraft maintenance and operational chemicals, testing procedures and application techniques. New cleaners and paint removers for organic matrix composites.
General. . . . .	Packaging, potting compounds, sputter coatings for erosion, oxidation, sulfidation control and fretting sulfidation.
Iron and Iron Alloys . . . . .	Fatigue, fracture, crack growth.

## MATHEMATICAL SCIENCES

Analysis (Mathematics) . . . . .	Complex variables, Fourier Analysis. Functional Analysis. Fourier analysis, catastrophe theory.
Operations Research. . . . .	Modeling, computer simulation.
Statistical Analysis . . . . .	Analysis of variance, regression, significance testing.

## MEDICINE AND BIOLOGY

Biochemistry . . . . .	Objective application of biochemistry to personnel subjected to severe stresses, including exposure to
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## APPLICATION AREA

## EXPERTISE

Biochemistry (contd) . . . . .	acceleration, via analysis of blood and urine for unique fractions quantitatively correlatable with exhaustion of human adaptive mechanisms and onset of pathology.
Cytology, Genetics, and Molecular Biology. . . . .	Identification of physical, chemical, and in-vitro enzymatic properties of products of degenerated mitochondria in urine. Correlation of properties of identified fractions with those of PGB <sub>x</sub> . Extension of in-vitro effort to in-vivo pathology to dramatically enhance monkey survival from myocardial infarction and recovery of rabbits from acute cerebral ischemia induced by arterial deprivation. Establishment of rational theory for the use of drug PGB <sub>x</sub> in replacement therapy for ischemic cellular damage in heart and brain.
Psychophysiology . . . . .	Studies of effects of stressors in inducing disorientation, the effects of task overload, personnel ability to track targets under acceleration, vibration and other combined stressors.
Physiology . . . . .	See under "Stress Physiology".
Radiobiology . . . . .	Use of isotopes as tracers in molecular biology.
Stress Physiology. . . . .	Studies of tolerance and performance of subjects exposed to acceleration and combined stresses on the human centrifuge. Definitions of mechanisms of debilitating stress to establish an objective index of stress proximity to intolerance and to institute protective measures for enhancing combat performance and survivability.

## APPLICATION AREA

## EXPERTISE

### NAVIGATION, GUIDANCE, AND CONTROL

Control Devices and Equipment. .	Human factors. Command guidance.
Guidance Systems . . . . .	Human Factors. Design and develop inertial units for Guidance Systems.
Navigation and Guidance System Components . . . . .	Design and develop all components for surface, subsurface and airborne platforms.
Navigation systems . . . . .	Design and develop all surface, subsurface and airborne systems.

### NUCLEAR SCIENCE AND TECHNOLOGY

Isotopes . . . . .	Use as tracers in biochemistry and molecular biology. Radiotracer permeation studies.
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### OCEAN TECHNOLOGY AND ENGINEERING

Physical and Chemical Oceanography . . . . .	Passive infrared (thermal) mapping and infrared radiometry.
Marine Geophysics and Geology. .	Analysis and measurement of gravity and magnetic fields.
Oceanographic Vessels, Instruments and Platforms. . .	Design and develop Navigation and Control Subsystems. Laser bottom profiles. Laser wave slope measuring device.

### ORDNANCE

Fire Control and Bombing System . . . . .	Weapons suspension and release equipment and aircraft integration.
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### PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . .	Holographic display systems.
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## APPLICATION AREA

## EXPERTISE

Photographic Techniques and  
Equipment. . . . . Development test and evaluation of  
airborne camera systems including  
long focal length optics, auto and  
range focusing systems, data  
annotation systems, panoramic and  
line scan system. Development of  
automated camera test equipment.  
Evaluation of silver halide and  
unconventional photographic  
technology.

Recording Devices. . . . . Development of acoustic and video  
recording devices. Aerial photog-  
raphy. Development of laser records.

General. . . . . Photo image enhancement techniques.

## PHYSICS

Acoustics. . . . . Design and development of underwater  
acoustic systems. Ocean parameters  
as applied to acoustic sensors.

Fluid Mechanics. . . . . Three-dimensioned, compressible,  
unsteady aerodynamics for Structural  
Airloads and Flutter analysis -  
Potential flow, Mach Box, Doublet  
Latter and Piston Theory. As applied  
to proper operation of systems being  
developed. Aircraft fluidic  
components and systems.

Optics and Lasers. . . . . Ring Laser Gyro Development.  
Development of metal vapor lasers.

Structural Mechanics . . . . . A/C Stress Analysis, Finite Element  
Methods, Nastran/Stags, Dynamic,  
Aero-Thermo-Servo-Plastic Analysis,  
Viscoelasticity, Vibration, Impact  
and Shock wave analysis. Buckling,  
fatigue and fracture mechanics.

Plasma Physics . . . . . Nuclear Magnetic Resonance Gyro  
Development.



APPLICATION AREA

EXPERTISE

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Human Resources. . . . . Application of human factors  
training research and techniques  
to improve personnel training,  
assessment of training effectiveness.

TRANSPORTATION

Global Navigation Systems. . . . Design and Development of all systems.

CONTACT: Mr. Jerome Bortman  
Code 7004  
Naval Air Development Center  
Warminster, Pennsylvania 18974  
Telephone: (215) 441-3100

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NAVAL AIR ENGINEERING CENTER  
Lakehurst, New Jersey 08733

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>COMPUTERS, CONTROL AND INFORMATION THEORY</u>	
Computer Software. . . . .	Computer programming, programming languages, compilers, etc.
Information Processing Standards. . . . .	Standards that are developed to provide for the economic and effective use of automatic data processing equipment and systems. These include standards for hardware, software, applications and data.
Information Theory . . . . .	Theoretical studies relating to the measurement and transmission of information in a communication channel. Includes coding theory, information capacity, detection of signals in noise, etc.
Pattern Recognition. . . . .	Includes feature extraction, image enhancement, image restoration, scene analysis and character recognition.
<u>ENVIRONMENTAL POLLUTION AND CONTROL</u>	
Air Pollution and Control. . . . .	Air pollution from exhaust gases, odors, dust, etc.; control techniques and equipment; sampling and analytical techniques and equipment.
Noise Pollution and Control. . . . .	Pollution in the environment by noise from any source including engine noise, machining noise, industrial noise, sonic boom.

## APPLICATION AREA

## EXPERTISE

Water Pollution  
and Control. . . . . Pollution by industrial wastes, anal-  
ysis of pollutants, thermal pollu-  
tion, oil pollution, control tech-  
niques and equipment.

## MATERIALS SCIENCES

Ablative Materials and  
Ablation . . . . . Heat resistant materials.

Adhesives and Sealants . . . . . Adhesives, glues, binders, etc. for  
all types of materials; sealants,  
seals and gaskets for all purposes.

Materials Degradation  
and Fouling. . . . . Aging, erosion, wear, weathering,  
deterioration, decay; biodeteriora-  
tion, including fungus deterioration,  
etc.; corrosion and corrosion inhi-  
bition; rusting; embrittlement;  
tribology.

Composite Materials. . . . . Materials composed of two or more  
physically distinct constituents.  
Includes reinforced plastics, carbon  
or graphite composites, laminates,  
metal matrix composites, fiber  
wound composites, filled composites,  
particulate composites, etc.

Corrosion and Corrosion  
Inhibition . . . . . Corrosion of metals and corrosion  
inhibition; metal corrosion  
inhibitors; rusting.

Lubricants and Hydraulic  
Fluids . . . . . Chemical, mechanical and physical  
properties, performance and produc-  
tion of all types of oils, lubricants  
and hydraulic fluids; lubricant and  
hydraulic fluid additives. Includes  
solid lubricants, drilling fluids,  
greases, etc.

APPLICATION AREA

EXPERTISE

NONDESTRUCTIVE TESTING

- Ultrasonic Testing . . . . . Subsurface flaw detection, thickness measurement and the characterization of metallurgical or material properties of structures or materials by interrogation with energy in the form of sound waves.
- Radiographic Testing . . . . . The use of radiant energy in the form of neutrons, X-rays or gamma rays for subsurface examination of opaque objects by producing graphical records or sensitized film.
- Miscellaneous Testing. . . . . Detection of surface or slightly subsurface flaws. Includes liquid penetrant, magnetic-particle, eddycurrent, etc.

CONTACT:

Mr. Michael Palamar  
Code 9011  
Naval Air Engineering Center  
Lakehurst, New Jersey 08733  
Telephone: (201) 323-2648  
Autovon: 624-2648

NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER  
Atlantic City, New Jersey 08405

APPLICATION AREA

EXPERTISE

ELECTRONICS AND AEROSPACE  
TECHNOLOGY

Air Traffic Control. . . . .	Terminal and enroute systems hardware components and equipment, software and software enhancements; data acquisition and display systems (radar and radar beaconry); collision avoidance systems; airborne and ground-based equipment; application of advanced technology.
Simulation and Analysis. . . . .	Analytical models, real and fast time simulation of aviation concepts, procedures and equipment; operations research; human factors engineering; man-machine relationships; performance measuring.
Communications . . . . .	Air-ground-air communications systems and equipment; spectrum management; interference identification and measurement; communications satellite system experimentation.
Guidance . . . . .	TACAN, VOR/DME, LORAN, OMEGA, VLF and Area Navigation systems and equipment; VHF and Microwave Landing Systems (ILS-MLS) and equipment; performance monitoring.
Aircraft Safety. . . . .	Crashworthiness; bomb security; flight and in-flight fire safety; postcrash fire safety; toxicity; aircraft and pilot performance; modified fuels and fuel systems; measurement of engine emissions.

APPLICATION AREA

EXPERTISE

Airport Safety . . . . . Airport lighting and visual guidance  
systems and equipment; airport weather  
observation and measurement; runway  
surfaces; wind shear; wake turbulence.

CONTACT:

James Woodall, Technical Advisor,

ANA-1A

FAA/NAFEC

Atlantic City, New Jersey 08405

Telephone: (609) 641-8200, ext 3670

FTS 8 346-3670

Autovon: 234-3670

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NAVAL BIOSCIENCES LABORATORY  
 Naval Supply Center  
 Oakland, California 94625

APPLICATION AREA

EXPERTISE

BUILDING INDUSTRY TECHNOLOGY

Architectural Design and Environmental Engineering Bioengineering . . . . .	Design and operation of enclosures, rooms, etc., for protection of workers in biological laboratories. Cost-effectiveness studies on air filtration requirements. Design of temperature controls.
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CHEMISTRY

Analytical Chemistry . . . . .	Scanning electron microscope, NMR spectroscopy, gas chromatography, atomic absorption analysis, standard analytical chemistry methods.
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ENVIRONMENTAL POLLUTION AND  
CONTROL

Air Pollution and Control. . . .	Tracer techniques and determination of air mass movement. Aerosol gen- eration research, sampling capabilities.
Water Pollution and Control. . .	Rapid fingerprinting techniques for identification of sources of petroleum spills in marine environment.
Pesticides Pollution and Control. . . . .	Basic studies on inhalation toxicity of airborne pesticides as influenced by particle size and concentration.
Environmental Health and Safety.	Basic studies on inhaled, particulate contaminates; oncogenic effects; studies on survival and infectivity of airborne microbes; aerosol hazards generated in biological laboratories, consultation available for assessment of biological (and limited chemical) hazards associated with a laboratory operation.

APPLICATION AREA

EXPERTISE

MEDICINE AND BIOLOGY

Biochemistry . . . . .	Biological systems chemistry, assay and analysis.
Immunology . . . . .	Experimental vaccines in animal hosts, routine and "state-of-the-art" ultra-sensitive detection of antiviral, antibacterial and antifungal antibodies, development of fungal, bacterial and viral antigens and the mechanisms of immunologic defense in experimental hosts.
Microbiology . . . . .	Study of airborne infections, microbial control of materials fouling the environment, ultrasensitive detection of bacterial, fungal and viral agents and routine clinical microbiology.
Pharmacology and Pharmacological Chemistry. . . . .	Sensitive models for evaluation of antifungal drugs in experimentally-produced deep fungal disease are being used. Basic, biochemical and clinical pharmacology services are available.
Public Health and Industrial Medicine . . . . .	The laboratory is a division of the School of Public Health, University of California, Berkeley.
Toxicology . . . . .	Study of inhaled pesticides in animal systems. The division of Marine Science has expertise in carrying out environmental toxicology research, including standard EPA bioassays, experiments on invertebrate uptake of Naval munitions wastes, interference in plankton growth of such wastes, and mutagenic properties using bacterial mutagenesis.



## APPLICATION AREA

## EXPERTISE

Veterinary Medicine. . . . . This medical service has a research support function to ensure continuing research animal colony accreditation by the American Association for Accreditation of Laboratory Animal Care and a research commitment to investigate the naturally occurring diseases of marine mammals, especially those transmissible to man.

## OCEAN TECHNOLOGY

Biological Oceanography. . . . . Expertise in coastal marine biology and related chemistry, with particular regard to occurrence, fate, and effects of oil and grease pollutants, particularly those of petroleum origin. Field sampling, pollutant monitoring and laboratory simulations of field conditions (microcosms), effects of dredging on inshore ecosystems, coral reef biology, and environmental analytic organic chemistry.

## PROBLEM-SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Environment. . . . . Rapid fingerprinting techniques for identification of sources of petroleum spills in the marine environment. Biodegradation studies are being undertaken on a variety of compounds of industrial and military interest; included are mutagenic potential assessments.

### CONTACT:

LT William M. Coleman III  
Naval Biosciences Laboratory  
Naval Supply Center  
Oakland, California 95624  
Telephone: (415) 832-6343  
Autovon: 836-6343

NORTH CENTRAL FOREST EXPERIMENT STATION  
Forest Service, USDA  
St. Paul, Minnesota

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:

Planning and Application AD  
North Central Forest Experiment Station  
U.S. Forest Service  
Folwell Avenue  
St. Paul, MN 55108  
Telephone: (612) 784-0251

NAVAL COASTAL SYSTEMS LABORATORY  
Panama City, Florida 32401

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Information Systems. . . . .	Local planning and tracking.
Research Program Administration and Technology Transfer. . . .	Resource data base development.

BIOMEDICAL TECHNOLOGY AND HUMAN  
FACTORS ENGINEERING

Biomedical Instrumentation and Bioengineering . . . . .	Diver monitoring.
Life Support Systems . . . . .	Underwater breathing, diver heating.

DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . .	Hi-definition saver; mine hunting; underwater small detection.
Electromagnetic & Acoustic Countermeasures. . . . .	Mine countermeasures; acoustic and torpedo countermeasures.
Magnetic Detection . . . . .	Cryogenic magnetometers; magnetic signal processing.
Personnel Detection. . . . .	Underwater swimmer detections.
Seismic Detection. . . . .	Hostile weapon location.

ELECTROTECHNOLOGY

Electromechanical Devices. . . . .	Underwater transducer; controlled acoustic noisemakers.
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ENVIRONMENTAL POLLUTION AND  
CONTROL

Solid Wastes Pollution and Control. . . . .	Ultrasonic sterilization.
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## APPLICATION AREA

## EXPERTISE

Water Pollution and  
Control. . . . . Ship waste water control.

## MATHEMATICAL SCIENCES

Operations Research. . . . . Navy missions and systems remine,  
acoustic, torpedo countermeasures,  
diving, special and amphibious  
warfare.

## MEDICINE AND BIOLOGY

Physiology . . . . . Diver physiology.

## NAVIGATION, GUIDANCE, AND CONTROL

Navigation Systems . . . . . Small area navigation.

## TRANSPORTATION

Marine & Waterway  
Transportation . . . . . Swimmer delivery vehicles;  
advanced craft T&E.

### CONTACT:

John Vickers  
Naval Coastal Systems Laboratory  
Panama City, Florida 32401  
Telephone: (904) 234-4420  
Autovon: 436-4420

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NORTHEASTERN FOREST EXPERIMENT STATION  
Forest Service, USDA  
Brookdale, Pennsylvania

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:

Albert Foulger  
Planning and Application AD  
Northeastern Experiment Station  
U.S. Forest Service  
6816 Market Street  
Upper Darby, Pennsylvania 19082  
Telephone: (215)-1614

NAVAL HEALTH RESEARCH CENTER  
San Diego, California 92152

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>BEHAVIOR AND SOCIETY</u>	
Job Training and Career Development. . . . .	Use of actuarial methods for determination of the effectiveness of decision process
<u>MEDICINE AND BIOLOGY</u>	
Biochemistry . . . . .	Studies of serum uric acid, serum cholesterol levels and brain waves as determinators for psychological and physiological stress.
Psychophysiology . . . . .	Sleep and sleep deprivation effects on the brain and on performance; effects of noise on performance; peak performance as a function of time of day.
Psychiatry . . . . .	Causes of psychiatric illness; how to evaluate the extent of the illness and how to estimate the chances for recovery.
Stress Physiology. . . . .	The effects of life changes on health and adjustment.

CONTACT:  
Dr. Milton Richlin  
Naval Health Research Center  
Code 8090  
San Diego, CA 92152  
Telephone: (714) 225-7393

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH  
Cincinnati, Ohio 45226

APPLICATION AREA

EXPERTISE

BEHAVIOR AND SOCIETY

Social Concerns. . . . . Conducts research on occupational stress and on the behavioral aspects of occupational safety and health.

CHEMISTRY

Analytical Chemistry . . . . . Develops analytical methods for chemical agents found in occupational exposures.

HEALTH PLANNING

Environmental and  
Occupational Factors . . . . . Recognition, evaluation, and control of occupational safety and health hazards; development of criteria for workplace safety and health standards; operates a Clearinghouse for Occupational Safety and Health Info.; annually publishes a Registry of Toxic Effects of Chemical Substances.

INDUSTRIAL AND MECHANICAL  
ENGINEERING

Industrial Safety  
Engineering. . . . . Conducts safety research; develops control measures and devices for application to industrial and other work sites; certifies respiratory protection equipment, detector tubes, coal mine dust personal sampler units, and sound level meters.

General. . . . . Conducts research on industrial process modifications and design; modification, and maintenance of industrial equipment; develops control technology for health and safety hazards in industrial and other work-places.

APPLICATION AREA

EXPERTISE

MEDICINE AND BIOLOGY

General. . . . . Conducts occupational safety and health research including toxicology; occupational carcinogens; epidemiology of occupational diseases, respiratory diseases, ergonomics, stress physiology, and behavioral factors; develops recommended programs for delivery of occupational safety and health services.

CONTACT: Mr. Al F. Schaplowsky  
National Institute for Occupational  
Safety and Health  
Robert A. Taft Laboratories  
4676 Columbia Parkway  
Cincinnati, OH 45226  
Telephone: (513) 864-8302  
FTS: 684-8302

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U.S. NAVAL OCEANOGRAPHIC OFFICE  
Bay St. Louis, MS 39522

APPLICATION AREA

EXPERTISE

OCEAN TECHNOLOGY AND  
ENGINEERING

Marine Geophysics and  
Geology. . . . .

Oceanographic Vessels,  
Instruments and  
Platforms. . . . .

Hydrography. . . . .

CONTACT: Mr. Clayton D. Griffith  
Code 3030  
U.S. Naval Oceanographic Office  
NSTL Station  
Bay St. Louis, MS 39522  
Telephone: (601) 688-4368  
Autovon: 485-4368

NAVAL OCEAN SYSTEMS CENTER  
 San Diego, California 92152

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Information Systems. . . . .	Planning, programming and budgeting.
Research Program Administration . . . . .	Research management development planning and forecasting, identification of R&D needs and technical problem areas.

AGRICULTURE AND FOOD

Animal Husbandry and Veterinary Medicine. . . . .	Marine mammal biology, care, feeding, management, testing, training, pathology.
Fisheries and Aquaculture. . . . .	Marine farming, cultivation of natural produce of ocean environment, marine mammal-fish interrelationships. Growing seaweed for commercial harvest as a potential fuel.

BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS

Biomedical Instrumentation and Bioengineering . . . . .	Associated with marine mammals. Controls for wheelchairs, noninvasive blood pressure monitoring, complete stretchers, bed scales.
Human Factors. . . . .	Ship design criteria for human performance, communication system layouts, effects of noise on performance and behavior, underwater systems for divers.
Life Support Systems . . . . .	Diver protection, decompression, safe ascent.
Bionics and Artificial Intelligence . . . . .	Marine animals.

## APPLICATION AREA

## EXPERTISE

### CHEMISTRY

- Analytical Chemistry . . . . . Techniques and instrumentation for separation and analysis of trace elements, individual compounds or specific groups of compounds both organic and inorganic.
- Polymer Chemistry. . . . . Additives to reduce hydrodynamic drag forces, fluid flow friction and dispersion in fluid jet streams.
- Photo and Radiation Chemistry. . . . . Radioactive elements and their reactions.

### COMMUNICATION

- Communication and Information Theory . . . . . Theoretical studies relating to the measurement and transmission of information in a communication channel.
- Radio and Television Equipment. . . . . General extensive experience in design of radio equipment.
- Common Carrier and Satellite. . . . . General extensive experience in satellite communication.

### COMPUTERS, CONTROL AND INFORMATION THEORY

- Computer Software. . . . . Large computer sciences department including systems architecture, applications software and ADP.
- Computer Hardware. . . . . Design and development of special purpose computers, hybrid computers, computer accessories.
- Control Systems and Control Theory . . . . . Theoretical studies of open- and closed-loop control systems, automatic control systems and principles including adaptive, continuous digital, distributed parameter, linear, multi-variable, nonlinear, predictive, etc.

## APPLICATION AREA

## EXPERTISE

- Information Theory . . . . . Theoretical studies relating to the measurement and transmission of information in a communication channel. Includes coding theory, information capacity, detection of signals in noise, etc.
- Pattern Recognition. . . . . Includes features extraction, image enhancement, image restoration, and character recognition.

## DETECTION AND COUNTERMEASURES

- Acoustic Detection . . . . . Detection by means of sound waves, including ultrasonic and infrasonic radiation.
- Optical Detection. . . . . Low light level TVs FLIRs, IR seekers.
- Electromagnetic and Acoustic Countermeasures. . . . . Interception, jamming, anti-jamming, and deception of acoustic signals.
- Nuclear Explosion Detection. . . Detection of nuclear explosions by measurement of nuclear radiation levels.
- Personnel Detection. . . . . Detection of personnel by monitoring acoustic or seismic anti-intrusion devices. Doppler radar for personnel, vehicle and boat detection.

## ELECTROTECHNOLOGY

- Circuits . . . . . Circuit theory, network analysis, filters, amplifiers, oscillators, logic circuits, printed circuits, electronic modules, commutators, power supply circuits, phase locked systems, etc.
- Electromechanical Devices. . . . Electromechanical actuators for underwater use with motors, relays, switches, connectors, cables, etc.

## APPLICATION AREA

## EXPERTISE

Power and Signal Transmission  
Devices. . . . . Electric wires and cables, and fiber optics for signal and data transmission, electronic filters, etc.

Semiconductor Devices. . . . . Transistors and solid state devices, integrated circuits, etc.

General. . . . . Extensive expertise in all ranges and areas of electrotechnology including antenna design, electro-optics, radio-wave propagation and nuclear effects on communication equipment.

## ENERGY

Reserves-sources . . . . . Marine related sources. Conversion of marine biomass, thermosyphon, waves, etc.

Fuel Conversion Processes. . . . . Conversion of seaweed, temperature-differences, and wave motion.

Heating and Cooling. . . . . Solar heating of buildings, swimming pools, water, etc.

Solar Energy . . . . . Solar heating of buildings, etc. (see above).

## ENVIRONMENTAL POLLUTION

Noise Pollution and Control. . . Sources of noise, effect of noise on humans, theory, measurements, and devices for noise control.

Water Pollution and Control. . . Control of shipboard created pollution sources. Pollution from municipal and industrial waste, radioactive materials, biological and ecological effects. Biological indicators of stress on marine animals caused by pollution. Detection of trace elements.

Radiation Pollution and  
Control. . . . . Pollution of environment by particles and electromagnetic radiation from natural and manmade sources. Sampling and analytical techniques.

## APPLICATION AREA

## EXPERTISE

### GOVERNMENT INVENTIONS FOR LICENSING

- Biology and Medicine . . . . . Numerous biomedical instrumentation available for licensing.
- Electrotechnology. . . . . Fiber optics connectors, ship collision avoidance calculator, noise figure indicator are samples of many items available.

### INDUSTRIAL AND MECHANICAL ENGINEERING

- Hydraulic and Pneumatic Equipment. . . . . Actuators for underwater applications.
- Non-destructive Testing. . . . . Ultrasonic, radiographic, hydrostatic, etc.

### LIBRARY AND INFORMATION SCIENCES

- Operations and Planning. . . . . Very large library available plus experience in all aspects of cataloging, filing, storage, etc.
- Reference Materials. . . . . Library available to federal employees. Also provides some reference materials to public and private personnel.

### MATERIALS SCIENCES

- Plastics . . . . . Acrylic domes and spheres for habitable underwater observation structures and vehicles.

### MATHEMATICAL SCIENCES

- Algebra and Number Theory. . . . . Field, group and number theory multilinear algebra, theory of equations, vector spaces, etc.
- Analysis (mathematics) . . . . . Calculus, calculus of variations, complex variables, differential equations, Fourier analysis, functional analysis, etc.

## APPLICATION AREA

## EXPERTISE

Geometry . . . . .	Differential and Euclidean geometry, tensor analysis, topology, trigonometry.
Mathematical Logic . . . . .	Foundations of mathematics, lattices, set theory, threshold logic.
Operations Research. . . . .	Large operational research department involved in projects such as minimum manning requirements for future Navy ships. Game, cueing, and search theory; mathematical models, mathematical programming; network flows.
Statistical Analysis . . . . .	Discriminate, factor, variance, and regression analysis. Nonparametric statistics, statistical decision theory, statistical distributions, statistical inference, statistical quality control, statistical tests.

## MEDICINE AND BIOLOGY

Anatomy. . . . .	Descriptive and comparative anatomy, dissection, neuroanatomy and morphology of marine animals.
Biochemistry . . . . .	Studies of chemical processes in biological systems in marine organisms.
Ecology. . . . .	Interrelationships of marine organisms and their environment, ecosystems and symbiosis in the marine environment.
Electrophysiology. . . . .	Electric activity associated with living marine organisms and involved with life processes. Electrocardiography and encephalography. Neural transmissions and responses of marine organisms to electrical stimulation.
Nutrition. . . . .	Related to marine animals.
Zoology. . . . .	Related to marine animals.

## APPLICATION AREA

## EXPERTISE

### NAVIGATION, GUIDANCE AND CONTROL

Control Devices and Equipment. .	Design, development and performance of underwater vehicles and weapons.
Guidance Systems . . . . .	Underwater weapon preset, command, homing and terminal guidance systems.
Navigation and Guidance Systems Components . . . . .	Acoustic underwater navigation systems for submersible vehicles and divers. Navigational sonars.

### NUCLEAR SCIENCE AND TECHNOLOGY

Nuclear Instrumentation. . . . .	Nuclear radiation detection and measurement devices and systems.
Radiation Shielding, Protection and Safety . . . . .	Nuclear safety engineering procedures. Transport requirements for radioactive materials.
Radioactive Wastes and Radioactivity. . . . .	Handling, storage, and disposal of radioactive wastes.

### OCEAN TECHNOLOGY AND ENGINEERING

Marine Engineering . . . . .	Design, construction and maintenance of marine equipment for underwater work, salvage, rescue, etc.
Dynamic Oceanography . . . . .	Study of waves, currents, tides, and air-sea interactions.
Physical and Chemical Oceanography . . . . .	Physical and chemical properties of sea water and the ocean bottom. Sea ice studies.
Biological Oceanography. . . . .	Plant and animal life as it relates to its marine environment. Biological fouling, fouling mechanisms, and organisms.



## APPLICATION AREA

## EXPERTISE

Marine Geophysics and Geology. . . . . Geophysical and geological studies and surveys of the marine environment.

Oceanographic Vessels,  
Instruments, and Platforms . . . . . Support vessels, stable platforms, instrumentation and equipment to collect and process oceanographic data. Manned and unmanned submersibles for exploration, search, rescue, location, escape and survey work underwater.

Underwater Construction and  
Habitats . . . . . Man in the sea environment. Techniques, equipment, systems for undersea activity. Underwater work vehicles.

## ORDNANCE

Fire Control Systems . . . . . Fire control, computers and directors for the firing of underwater weapons.

Underwater Ordnance. . . . . Torpedo - air, surface, and underwater launched.

## PHYSICS

Acoustics. . . . . Generation and transmission of sound through water. Includes ultra- and infra-sonics.

Fluid Mechanics. . . . . Theoretical and experimental studies of the dynamics and statics of fluids and of relative motion between fluids and solid bodies. Hydrodynamic and boundary layer studies.

Optics and Lasers. . . . . Ground-to-ground communications, air-to-sea communications, seawater penetration of lasers.

Solid State Physics. . . . . Physical properties of solids, semi-conductors, etc. Acoustic receivers and transmitters.

## APPLICATION AREA

## EXPERTISE

Structural Mechanics . . . . . Dynamics and statics of solid bodies, hollow shells and spheres. Kinetics, kinematics, shock and vibration, stress analysis and hydrodynamics.

### PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Energy . . . . . Energy from marine biomass. Solar energy.

Environment. . . . . Marine environment. Urban noise and industrial noise.

Police and Fire. . . . . Propagation studies for fire department communications, speech scramblers, electronic devices for surveillance.

### TRANSPORTATION

Global Navigation Systems. . . . . Developer of Omega worldwide navigation system.

### URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

Environmental Management and Planning . . . . . Marine pollution and urban noise abatement and control.

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NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER  
San Diego, California 92152

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Information . . . . .	Computer-based management information system.
Management Practice. . . . .	Coordination of research and development efforts. Measurement of job performance.
Personnel Management, Labor Relations and Manpower Studies. . . . .	Techniques for forecasting and costing of labor supply.
Research Program Administration and Technology Transfer. . . .	Coordination of research and development efforts. R&D applications program, Technology Transfer program.

BEHAVIOR AND SOCIETY

Job Training and Career Development. . . . .	Techniques and aids for enhancing performance. Development of training technology. Test and application of training systems. Research on acquisition of basic skills, and on information and decision processing. Selection using aptitude and vocational interest tests. Prediction of attrition.
Psychology . . . . .	Attitude and motivation research. Applied psychobiology. Cross-cultural research.
Social Concerns. . . . .	Research on social issues, including race relations, women in non-traditional careers, drugs, and alcoholism.

## APPLICATION AREA

## EXPERTISE

### BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

Human Factors Engineering. . . . Human factors evaluations of new and more automated systems.

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Software. . . . . Design and development of computer programs for data processing and statistical analysis.

### HEALTH PLANNING

Environmental and Occupational Factors. . . . . Effects of shipboard environmental factors on job performance.

### LIBRARY AND INFORMATION THEORY

General. . . . . Collection of books and journals in the social sciences. Lockheed Dialog system abstract search facilities.

### MATHEMATICAL SCIENCES

Operations Research. . . . . Analysis of management systems.

Statistical Analysis . . . . . Discrimination, cluster, variance, and regression analysis. Nonparametric statistics, statistical decision theory, distributions and inference.

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U.S. ARMY NATICK RESEARCH AND DEVELOPMENT COMMAND  
Natick, Massachusetts 01760

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Information  
Systems. . . . . Computer based resource management  
system.

AERONAUTICS AND AERODYNAMICS

Parachutes . . . . . Systems and techniques for airdrop  
of personnel supplies and material  
from aircraft in flight.

AGRICULTURE AND FOOD

Food Technology. . . . . Food processing and preservation;  
food service equipment; food pack-  
aging; food science research and  
development.

CHEMISTRY

Analytical Chemistry . . . . . Mass spectrometers, gas/liquid  
chromatography, nuclear magnetic  
resonance spectroscopy, infrared/  
ultra violet/visible spectro-  
photometry, computer/analytical  
instruments interface.

ENVIRONMENTAL POLLUTION AND  
CONTROL

Solid Wastes Pollution and  
Control. . . . . Cellulose conversion process; solid  
waste management system; chemical/  
physical/biological treatment of  
solid wastes.

Water Pollution and  
Control. . . . . Anaerobic waste water treatment;  
design criteria for full-scale  
waste water treatment facility.

MATERIALS SCIENCES

Fibers and Textiles. . . . . Individual protection clothing,

APPLICATION AREA

EXPERTISE

Fibers and Textiles (Contd.) . . personnel armor and personal life support equipment systems.

MATHEMATICAL SCIENCES

Operations Research. . . . . Application of scientific methods, construction models, conducts tests and surveys to determine effectiveness of current and potential operating systems.

MEDICINE AND BIOLOGY

Microbiology . . . . . Detect incipient microbial spoilage, microorganisms and their toxins, control contamination by assuring good sanitation and preventing proliferation of microorganisms.

Nutrition. . . . . Determine nutritional adequacy of foods and effects of storage, processing, new preservation techniques and new formulations.

CONTACT:

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U.S. Army Natick Research and  
Development Command  
Natick, Massachusetts 01760  
(617) 653-1000, Ext. 2577

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NAVAL RESEARCH LABORATORY  
Washington, D. C. 20375

APPLICATION AREA

EXPERTISE

CHEMISTRY

Polymer Chemistry. . . . .	Polymer characterization, combustion diagnostics atmosphere monitoring, mechanics and kinetics of chemical reactions. Basic and applied research in polymer synthesis and on structure properties. Areas: organic polymers, coatings, adhesives, composites, and polymer mechanics.
Analytical Chemistry . . . . .	Advanced inorganic materials, Solid State Solution and Theoretical Chemistry, Electrochemical Devices and Electrode Structure.
Physical and Theoretical Chemistry. . . . .	Colloid chemistry of oil and water wastes, surface phenomena of adhesion, lubrication, corrosion, catalysis, properties of molecules at interface, research in friction, wear and lubrication of sliding and rolling contacts; atmosphere control.

ENERGY

Fuels. . . . .	Fuels, including synthetic liquids, fire extinguishment, combustion and fire research, control of smoke and fire.
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MATERIALS SCIENCES

General. . . . .	Microstructural characterization, weldability of advanced alloys, thermomechanical effects, Micro-mechanisms of crack growth, Naval fabrication and processing.
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## APPLICATION AREA

## EXPERTISE

Ceramics, Refractories, and Glass. . . . .	Processing and fabrication, micro- structural development and charac- terization, strength and fracture behavior, plastic deformation; study and application, ceramics for elec- tronic piezoelectric optical and other nonmechanical applications.
Non-Destructive Testing. . . . .	Physical, mechanical and failure characterizations, fabrication and processing techniques, mechanical and failure analyses, high-temperature structural and ordnance applications.
General. . . . .	Sub-critical crack growth and frac- ture, failure-safe design parameters, metallurgical optimization for high- strength metals, corrosion science related to advanced alloys, marine corrosion and cathodic protection. Elevated temperature behavior of materials, influence of environment on high temperature materials, basic mechanisms of radiation damage, cri- teria for improved structural design using high temperature materials. Reliability and life prediction techniques.

## PHYSICS

Optics and Lasers. . . . .	Electronic and magnetic properties, thermal and optical properties, laser materials interactions, optical ra- diation vulnerability, magnetostric- tion, advanced structural materials.
General. . . . .	High-pressure effects, superconduct- ing materials, superconducting electronics.
Structural Mechanics . . . . .	Electronic properties on nonmetallic crystals and glasses, radiation in- duced defects, color centers, optical properties: fibers, windows, data processing materials.



## APPLICATION AREA

## EXPERTISE

General. . . . . Resonance in magnetic materials, spin-ordered magnetic phenomena, rare earth - transition metal magnetic materials, magnetic properties of amorphous materials. X-ray spectrochemical analysis, X-ray diffraction, band structure and superconductivity, plasma diagnostics. Phase transformations, crystalline defect states, microstructural effects in superconductors, elasticity, plasticity, mechanical phenomena. Radiation effects on infrared detectors, optical and electronic materials, and satellite components, solar cells, radiation belts, hardening satellite components against laser beams, radiation vulnerability, radiation curing of polymers, 2-MV-electron Van de Graaff, cobalt-60 source. Measurements on targets bombarded by MeV electron beams, deposition of energy by charged particles, high-intensity laser beam propagation, neutron transport, coherent bremsstrahlung beam propagation, neutron reactions in tissue resident elements. Materials analysis by means of charged particle beams, implantation of ions into solids energy charged particle beams, radiation effects caused by high energy charged particle beams, radiation damage in reactor materials, crystal studies by means of particle channeling techniques, ion-induced X-rays, modification of surface and subsurface properties by ion-implantation, 5 MV Van de Graaff. Preparation and development of magnetic dielectric, optic, and semiconductor materials, optical components and coatings, glass blowing, and microwave tube assembly. Surface and interface physics, cathode research and development, characterization of and growth of semiconductor, metal, and insulator films and surfaces, bonding and adhesion studies, thermionic energy

## APPLICATION AREA

## EXPERTISE

conversion. Surface acoustic waves, microwave and millimeter wave integrated circuits, surface magnetostatic waves, microwave solid state sources, microwave ferrimagnetic components, millimeter wave device research.

Physics. . . . . Ion implantation technology, high and low power devices for energy conversion, field effect transistor reliability and failure analysis, MIS failure physics; radiation vulnerability and hardening, high frequency microwave devices.

## MEDICINE AND BIOLOGY

Radiobiology . . . . . Radiations for biological and medical purposes, neutron beams for cancer therapy, radioisotope production, ion-induced X rays, 75 MeV cyclotron.

## ELECTROTECHNOLOGY

General. . . . . Silicon device processing, micro-electric fabrications, integrated circuit technology.

Semiconductor Devices. . . . . Solid state theory, electrical and optical characterization of materials, impurity and defect studies, structural and electronic properties of amorphous semiconductors, optical magneto-optical studies of surface and interfaces.

### CONTACT:

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DAVID W. TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER  
Bethesda, Maryland 20814

APPLICATION AREA

EXPERTISE

AERONAUTICS AND AERODYNAMICS

- |  |   |
|--|---|
| Aerodynamics . . . . .                 | Aerodynamic development and support for following aircraft: Vertical/Short Takeoff and Landing; Circulation Control Rotor; X-Wing; remotely Piloted; and Wing in Ground Effect. |
| Test Facilities and Equipment. . . . . | Subsonic and transonic wind tunnels and an anechoic flow facility.  |

BUILDING AND INDUSTRY TECHNOLOGY

- |  |   |
|--|---|
| Structural Analysis. . . . .                           | Computer and laboratory facilities for structural analysis of Naval ships.                        |
| Construction Materials, Components and Equipment . . . | Materials development research includes new alloys, plastics, elastomers, composites and coating. |

COMPUTERS, CONTROL AND INFORMATION THEORY

- |                            |   |
|----------------------------|---|
| Computer Software. . . . . | Computer services and techniques for management problems, naval design and construction, and many areas of mathematical analysis. |
|----------------------------|---|

DETECTION AND COUNTERMEASURES

- |                              |   |
|------------------------------|---|
| Acoustic Detection . . . . . | Acoustic silencing of submarines and surface ships including reduction of sonar self-noise and target strength. |
|------------------------------|---|

ENERGY

- |   |  |
|---|--|
| Electrical Power Transmission . . . . . | Engineering research to improve machinery and propulsion systems, and study of advanced electrical propulsion and power systems. |
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## APPLICATION AREA

## EXPERTISE

Fuels. . . . . Research in fuel development.

Engine Studies . . . . . Research to improve shipboard machinery and propulsion systems.

## ENVIRONMENTAL POLLUTION AND CONTROL

Noise Pollution and  
Control. . . . . Machinery Acoustic Analysis Test  
Center for noise reduction.

Solid Wastes Pollution and  
Control. . . . . Research concerning abatement of air  
and water pollution from Navy ships.

Water Pollution and  
Control. . . . . Research concerning abatement of  
water pollution from Navy ships.

## INDUSTRIAL AND MECHANICAL ENGINEERING

Non-destructive Testing. . . . . Non-destructive testing of fabri-  
cated structures.

## MATERIAL SCIENCES

Composite Materials. . . . . Materials development research  
including composites.

Iron and Iron Alloys . . . . . Materials development research  
including iron alloys.

Lubricants and Hydraulic  
Fluids . . . . . Materials development research  
including lubricants.

Materials Degradation and  
Fouling. . . . . Materials development research  
including fouling problems.

Nonferrous Metals and  
Alloys . . . . . Materials development research  
including nonferrous metals and  
alloys.

APPLICATION AREA

EXPERTISE

OCEAN TECHNOLOGY AND ENGINEERING

Marine Engineering . . . . . Research and Development Center for Naval Vehicles utilizing towing basins, test tanks, variable pressure water tunnels, circulating water channel, and other unique facilities.

TRANSPORTATION

Marine and Waterway  
Transportation . . . . . Current concepts under research and development include Hydrofoils, Surface Effect Ships, Air-cushion vehicles, Small Waterplane-Area-Twin-Hull Ships and conventional Naval vehicles.

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NAVAL SURFACE WEAPONS CENTER  
White Oak, Silver Spring, Maryland 20910

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration and Technology Transfer. . . .	Research management; development planning and forecasting; technology transfer program.
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AERONAUTICS AND AERODYNAMICS

Aerodynamics . . . . .	Research and development in aerodynamics, hydrodynamics, and ballistics.
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Parachutes and Decelerators. . .	Design, fabrication, and flight testing of deployable aerodynamic decelerators (such as parachutes, balloons, and decoys) for use in retardation, stabilization, flotation, and recovery of ordnance or in the acquisition of test data pertaining thereto.
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Test Facilities and Equipment. . . . .	Facilities include a diverse complex of modern wind tunnels (to Mach 17), ballistics ranges, and hydroballistics tanks.
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ATMOSPHERIC SCIENCES

Physical Meteorology . . . . .	Meteorological and propagation support for predicting and assessing electro-optical system performance.
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BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

Prosthetics and Mechanical Organs . . . . .	Fabrication of intermedullary rods and hip prothesis models for Army Medical R&D Command. These items entail the use of NITINOL, the "metal with a memory".
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Life Support Systems . . . . .	Development and testing of chemical and biological detection and protection devices.
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## APPLICATION AREA

## EXPERTISE

### CHEMISTRY

- Analytical Chemistry . . . . . Ultra-microanalysis of explosives, thin layer chromatography of explosives; nuclear magnetic resonance spectroscopy; gas chromatography; high pressure liquid chromatography; mass spectroscopy. Sulphur chemistry of lithium/SO<sub>2</sub> batteries.
- Industrial Chemistry and  
Chemical Process  
Engineering. . . . . Separators for secondary silver oxide/zinc batteries. Investigation of gas scrubbing systems. Atmospheric contaminant detection, control, and disposal.
- Polymer Chemistry. . . . . High energy polymers (synthesis and characterization).
- Basic and Synthetic Chemistry. . . . . Synthesis of high energy materials (nitro-compounds, fluoro-nitro compounds).
- Photo and Radiation Chemistry. . . . . Photochemistry of aromatic nitro-compounds.
- Physical and Theoretical  
Chemistry. . . . . Crystal and molecular structure. X-ray diffraction of aromatic and aliphatic nitro-compounds. Molten salt battery technology. High pressure reaction kinetics (spectroscopy). Pressure, volume, and temperature measurements of explosives. Explosive reactions between metals and/or reactive materials. Reaction kinetics, shock sensitivity, and thermal relaxation processes of explosives. Augmentation of explosive energy. High energy polymorphs. Physics and chemistry of propellants; transient burning rates, dynamics bulk modulus, and intrinsic instability of solid propellants, ignition phenomena of solid propellants. Evaluation of chemical warfare agents; detection techniques.

## APPLICATION AREA

## EXPERTISE

### COMPUTERS, CONTROL AND INFORMATION THEORY

- Computer Hardware. . . . . Hardware adaptation for weapons test sets; application of microprocessors to weapons guidance systems; development of modular fire control minicomputers for fleet ballistic missiles and tactical weapons applications.
- Computer Software. . . . . Software for sonar data reduction; for torpedo guidance; software adaptation for weapons test sets; software for trajectory simulation of missiles and torpedoes; programming for problems in hydrodynamics, aerodynamics, radar signatures, acoustic scattering, high energy lasers, and various other problems arising in the general mission function support of the Center; fire control software for fleet ballistic missiles; surface fire control software for tactical weapons; trajectory and model simulation in the hybrid computer facility (analog plus digital); geodesy and astronautics programming; software for intelligence analysis (Navy, Marine Corps); software for the AEGIS Combat System; computer graphics software for electronic circuits and mechanical design and for geoballistic and orbital problems.
- Control Systems and  
Control Theory . . . . . Surface weapon system control and integration; max-min optimization theory.
- Pattern Recognition and  
Image Processing . . . . . Electro-optical, electromagnetic, and acoustical signal processing.

### DIRECTION AND COUNTERMEASURES

- Acoustic Detection . . . . . Undersea acoustic surveillance; acoustic simulation; advanced submarine sonars; advanced passive sonobuoys; processing of acoustic data.



## APPLICATION AREA

## EXPERTISE

### Infrared and Ultraviolet

- Detection. . . . . Narrow-band infrared detector development; multicolor crystalline and amorphous infrared detector development; atmospheric transmission; infrared signatures.
- Magnetic Detection . . . . . Magnetic signature reduction. Magnetic sensor; magnetometer development; microsensor design and fabrication.
- Seismic Detection. . . . . Seismic sensors.
- Optical Detection. . . . . Search sets, laser radars.

## ELECTROTECHNOLOGY

- Antennas . . . . . Design of microstrip and other conformal antennas; castable antennas; short pulse antennas. Test and evaluation in anechoic chambers.
- Circuits . . . . . Special packaging of microelectronic circuits. Advanced computer memory design. Computer aided design of microelectronic circuits.
- Electromechanical Devices. . . . . Adaptive optics.
- Optoelectronic Devices and Systems. . . . . Adaptive optics; search sets, laser radar, electro-optic (warhead) fuzes.
- Power and Signal Transmission Devices. . . . . Pulse-power transmission.
- Resistive, Capacitive and Inductive Components . . . . . Thick and thin film hybrid circuits; Cermet resistor fabrication. Photolithography and chemical processing of microelectronic circuitry; sputter processing.
- Semiconductor Devices. . . . . Infrared detector development; radiation hardness testing; amorphous semiconductor photodetection; electronic noise studies.

## APPLICATION AREA

## EXPERTISE

### ENERGY

- Energy Use, Supply, and Demand . . . . . Computer-based electrical energy management system.
- Batteries and Components . . . . . R&D in electrochemical power sources.

### ENVIRONMENTAL POLLUTION AND CONTROL

- Air Pollution and Control. . . . . Study of air pollution monitoring and control technology. Design and fabrication of a mobile wet scrubber facility and a mobile electrostatic precipitator facility to determine experimentally the effectiveness of each type of control on various sources of fine particulates.
- Noise Pollution and Control. . . . . Noise abatement and control. Design concept for system to measure acoustic noise at remote locations.
- Radiation Pollution and Control. . . . . Design and development of radiation instruments for health physics and development of personnel dosimeters.

### INDUSTRIAL AND MECHANICAL ENGINEERING

- Quality Control and Reliability. . . . . Development and testing of product quality control and reliability procedures and standards.
- Environmental Engineering. . . . . Measurement and simulation of all natural and induced environments.
- Manufacturing Processes and Materials Handling . . . . . Development of prototype manufacturing procedures with associated product handling and packaging.
- Nondestructive Testing . . . . . X-rays, ultrasonics, optical, etc.

## APPLICATION AREA

## EXPERTISE

### MATERIAL SCIENCES

Ablative Materials and Ablation . . . . .	Strategic systems materials technology (carbon-carbon composites, bulk graphite); rocket nozzle materials; reentry nosetips.
Ceramics, Refractories, and Glass. . . . .	Reentry nosetips; electromagnetic sensor windows.
Composite Materials. . . . .	Carbon-fiber and Kevlar-fiber reinforced plastics. Degradation studies: moisture, ultraviolet radiation, abrasion, rough handling. Failure mechanisms. Silicon carbide/aluminum alloy matrix modification. Mechanical properties evaluation. Process development. Joining development of metal matrix composites. Positron nondestructive testing. Composite armor design and evaluation.
Corrosion and Corrosion Inhibition . . . . .	Corrosion resistance of composites; graphite/aluminum, silicon-carbide/aluminum aircraft alloys. Depleted uranium alloys; atmospheric corrosion; aqueous corrosion, stress corrosion cracking.
Elastomers . . . . .	Shock and vibration attenuation in polyurethane foams. Hydrolytic stability. Fluid and solvent resistance. Anechoic coatings.
Fibers and Textiles. . . . .	Kevlar-Mylar composites for aerostats. Abrasion resistance, rough handling, ultraviolet radiation degradation.

## APPLICATION AREA

## EXPERTISE

Iron and Iron Alloys . . . . .	Analytical and experimental investigation of armor materials. Improved design and fabrication techniques for gun barrels to extend fatigue and wear life and reduce weight. Design, fabrication and evaluation of blast-fragmentation warheads. Magnetic measurements on HY 80, HY 100 Steels; effects of processing and material texture on magnetic properties. Controlled fragmentation techniques. Dynamic fracture studies. Design and evaluation of high strength steel and heavy metal alloy penetration. Ballistic evaluation of armor materials.
Lubricants and Hydraulic Fluids . . . . .	Characterization of ignition/combustion properties of oils, lubricants and hydraulic fluids.
Materials Degradation and Fouling. . . . .	Moisture and ultraviolet degradation of Kevlar and carbon. Hydrolytic stability of polyurethane foams. Ultrasonic detection of defects.
Miscellaneous Materials. . . . .	Intermetallic reactions for underwater cutting; pyranol self-destruct devices. Soft magnetic amorphous materials; magnetic properties. Metallurgical and metallographic investigations.
Nonferrous Metals and Alloys . .	Lithium/boron alloys, lithium/boron/magnesium lightweight structural alloys (characterization). Nitinol applications. Technology for fabrication of lightweight battery electrodes (Ni-Cd batteries). Electrochemistry of lithium/boron alloy electrodes. Molten salt battery technology.
Plastics . . . . .	Low loss millimeter wave properties of polymers and composites. Molding materials for encapsulating compounds. Zero shrinkage polymers (synthesis, spiro-ortho esters). Relations of physical properties to molecular structure. Compressibility, acoustic properties, electrical resistance, impact resistance.

## APPLICATION AREA

## EXPERTISE

Refractory Metals and Alloys . . Erosion resistant materials. Nose cones. Tantalum/carbon-loaded graphite materials.

## MATHEMATICAL SCIENCES

Analysis (Mathematics) . . . . . Fluid mechanics, structural mechanics, numerical analysis, aeroballistics, geoballistics.

Geometry . . . . . Projective geometry.

Mathematical Logic . . . . . Computer software design.

Operations Research. . . . . Probability theory, game theory, optimization theory, utility theory.

Statistical Analysis . . . . . Bayesian and non-Baysian statistics; design and analysis of experiments.

## NATURAL RESOURCES AND EARTH SCIENCES

Snow, Ice, and Permafrost. . . . . Acoustic phenomena in the arctic environment.

## NAVIGATION, GUIDANCE, AND CONTROL

Control Devices and Equipment. . Aerodynamic and hydrodynamic control devices.

Guidance Systems . . . . . Surface-to-surface and surface-to-air guidance; underwater guidance.

Navigation and Guidance  
System Components. . . . . E/O, RF, and IR detectors; active and semiactive guidance subsystems satellite transmitters and receivers.

Navigation Systems . . . . . Data link design; orbital mechanics; satellite geodesy; satellite and ocean communication.

## NUCLEAR SCIENCE AND TECHNOLOGY

Isotopes . . . . . Nuclear chemistry facility for handling high and low activity levels of radionuclides (including plutonium and strontium 90 used in isotopic generators).

## APPLICATION AREA

## EXPERTISE

Nuclear Auxiliary Power Systems. . . . .	Studies in the environmental interaction of SNAP devices.
Nuclear Explosions and Devices. . . . .	Effects of underwater nuclear explosions. Effects of atmospheric explosions, including effects on electronics. Thermal radiation effects, shielding and radiation detection, and air blast. Design of nuclear weapons with low intrinsic (ambient) radiation.
Nuclear Instrumentation. . . . .	Design and development of radiation instruments for health physics and development of personnel dosimeters.
Radiation Shielding, Protection, and Safety . . . . .	Shielding of nuclear weapons aboard ship for personnel protection from neutrons and gamma rays.
Reactor Engineering and Power Plants . . . . .	Measurement of radionuclides escaping from nuclear power plants and studies of entry into man's food chain. Consult on nuclear reactor safety problem (shock wave propagation, safety engineering, design review and analysis with respect to containment capability).
Reactor Physics. . . . .	Neutron transport theory.

## ORDNANCE

Ammunition, Explosives and Pyrotechnics . . . . .	R&D of gun ammunition (76 mm to 8-inch); R&D in explosives, fuzes and warheads for Naval weapons.
Armor. . . . .	Ballistic evaluation of armor materials. Composite armor design and evaluation.
Bombs. . . . .	Exterior ballistics of free-fall weapons; design and optimization of bomb fuzes.

## APPLICATION AREA

## EXPERTISE

Detonations, Explosion Effects, and Ballistics . . . . .	Detonation theory; mathematical modeling of explosions and their effects; nuclear weapons effects; ballistics and hyperballistics (theory and test facilities).
Fire Control and Bombing Systems. . . . .	Electro-optical, electromagnetic, and hydroacoustical fire control systems; OTH (Over-the-Horizon) tracking; fuzing effects and explosive effects.
Guns . . . . .	Engineering design and testing of guns, gun mounts, and ammunition.
Rockets. . . . .	Surface-to-surface, surface-to-air, underwater; propulsion technology; launchers and guidance.
Underwater Ordnance. . . . .	Mines, torpedoes, sonars, swimmer devices, rockets, fire control.
General. . . . .	Principal Navy R&D Center for Surface Warfare.

## PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . .	Holographic interferometry (system design and fabrication).
Photo-Electro-optical Engineering. . . . .	Design of night vision cameras; IR covert operation cameras; polarization recorder for road surface texture measurement.
Photographic Techniques and Equipment. . . . .	Technical photography; high-speed data acquisition; portable, shoulder-mounted, aerial drop photography.
General. . . . .	Audiovisual production and projection techniques.

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## APPLICATION AREA

## EXPERTISE

### PHYSICS

Acoustics. . . . . Anechoic coatings (theoretical and experimental studies); scattering of sound by viscoelastic structures; modulus of elasticity; dispersion of sound; nonlinear acoustics.

Fluid Mechanics. . . . . Boundary layer transition; turbulent boundary layers; vortex fields; compressibility of viscous fluids; projectile motion; water-entry problems.

Optics and Lasers. . . . . Far infrared laser design; adaptive optics; laser radars.

Solid State Physics. . . . . Electrooptical, magneto-optical, and transport properties of narrow band-gap semiconductors. High field transport phenomena and magneto-phonon resonance in III-V compounds. Magneto-elastic effects in rare earth/iron compounds. Domain wall dynamics in thin magnetic films. Radiation damage in semiconductors. Transport phenomena in rare earth doped IV-VI alloys.

Plasma Physics . . . . . Propagation of electron beams. Interaction of high intensity charged particle beams with matter. Plasmas produced by high intensity X-ray sources.

Radiofrequency Waves . . . . . Dielectric millimeter wave transmission lines. High power radiofrequency generators.

General Physics. . . . . Properties of dielectrics. Magnetic properties of rare earth/iron compounds. Ion implantation depth profiles. Surface analysis (elemental composition of surfaces). Statistical physics. Electronic noise. Physics of high pressure. Non-equilibrium statistical mechanics. Equations of state at high pressure. Cohesive energy calculations. Statistical theory of liquids and solids. Fracture Mechanics.



## APPLICATION AREA

## EXPERTISE

### PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

#### Police, Fire, and Emergency

Services . . . . . Night vision device evaluation. Small, low-power, programmable electronic timer for covert switch actuation. Graphical slide rule to estimate downwind hazard from accidental chemical discharges.

Environment. . . . . Ordnance pollution abatement; methods to eliminate waste propellant, explosive, and pyrotechnic materials and to monitor these materials in the environment. Noise abatement and control. Design and fabrication of mobile wet scrubber and mobile electrostatic precipitator to measure effectiveness of each type on various sources of fine particulates.

### TRANSPORTATION

Transportation Safety. . . . . Developing system to reduce incidence of derailment (wheel-bearing temperature and vibration sensors with automatic air-brake actuator). Developed standards for packaging hazardous materials. Mobile unit for rapid measurement of highway surface texture.

### URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

#### Transportation and Traffic

Planning . . . . . Self-powered vehicle detector for traffic counting and control.

#### CONTACT:

F. J. Gleason  
Naval Surface Weapons Center  
Code CL  
White Oak, Silver Spring,  
Maryland 20910  
Telephone: (301) 394-1505  
Autovon: 290-1505

NAVAL UNDERWATER SYSTEMS CENTER  
New London, Connecticut 06320

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Inventory Control. . . . .	Inventory control systems, minor property, instrumentation, plant account.
Management Practice. . . . .	Procurement management systems, cost analysis, management analysis, effectiveness evaluation of laboratory performance.
Management Information . . . . .	Zero base budgeting, equipment management.
Personnel Management, Labor Relations, and Manpower Studies. . . . .	Personnel evaluation, resource and workload analysis, project management training source.
Research Program Administration and Technology Transfer. . . . .	R&D planning and management, identification of technical problem areas and research needs, technology transfer program.
Computer Application . . . . .	Data base systems for management, PERT.

AGRICULTURE AND FOOD

Fisheries and Aquaculture. . . . .	Instrumentation.
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BEHAVIOR AND SOCIETY

Psychology . . . . .	Environmental reaction and personnel interactions, job satisfaction, human behavior, adjustment, attitudes, intelligence, judgment, leadership and motivation, personality studies.
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## APPLICATION AREA

## EXPERTISE

### BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

- Biomedical Instrumentation and Bioengineering . . . . . Extensive sensors and signal processing displays and specialized instrumentation capabilities, ultrasonic theory and transducer design.
- Human Factors Engineering. . . . . Display systems, format evaluation, capacity for studies and equipment review to meet human engineering standards.

### COMMUNICATION

- Common Carrier and Satellite . . . . . Satellite systems used for communication navigation and data links for oceanographic programs.
- Graphics . . . . . Extensive graphic display capability for use in data analysis as well as system configuration experiments.
- Verbal . . . . . Extensive analysis capability with experience in speech scramblers.
- Communication and Information Theory . . . . . Submarine radio and acoustic communication systems.

### COMPUTERS, CONTROL AND INFORMATION THEORY

- Computer Hardware. . . . . Extensive use of all types of computers and computer systems for instrumentation as well as military systems.
- Computer Software. . . . . Computer programming, programming languages, large-scale systems of computer applications.

### DETECTION AND COUNTERMEASURES

- Acoustic Detection . . . . . Major portion of the Center's mission related to sonar system development and acoustic data collection.

## APPLICATION AREA

## EXPERTISE

Electromagnetic and Acoustic Countermeasures. . . . .	Program work involved in both hull-mounted and deployable countermeasures.
Infrared and Ultraviolet Detection. . . . .	Infrared surveys of ocean temperature and thermal plumbs in thermal gradients.
Optical Detection. . . . .	Night vision devices for shipboard application and submarine periscope systems.
Radio Frequency Detection. . . . .	ULF and VLF radio communication programs and related propagation studies.

## ELECTROTECHNOLOGY

Antennas . . . . .	Specifications of antenna configurations for submarine communication and data buoys.
Circuits . . . . .	Design and design review capability of analog and digital circuits.
Optoelectronic Devices and Systems. . . . .	Underwater laser applications and submarine periscope studies.

## ENERGY

Engine Studies (Energy Related) . . . . .	Small high performance combustible engine for torpedo applications and test and evaluation of high density fuels.
Batteries and Components . . . . .	Battery development capability for high energy density storage systems for electrically propelled torpedos and other uses.
Solar Energy . . . . .	Experience in solar systems design for domestic hot water, heating and cooling buildings, large scale photovoltaic systems and ocean engineering in support of thermal energy conversion projects.

## APPLICATION AREA

## EXPERTISE

### Miscellaneous Energy

Conservation and Storage . . . Photovoltaic applications, wind plant siting, hybrid systems, fuel cells and advanced heat pump designs, energy conversion systems.

Environmental Studies. . . . . Monitoring of river dredging, deep ocean surveys, studies related to coastal areas, and analysis capability including detection of heavy metals in salt water.

## ENVIRONMENTAL POLLUTION AND CONTROL

Noise Pollution and Control. . . Extensive capability in acoustic data collection and analysis.

### Environmental Impact

Statement. . . . . Experience in preparation of Environmental Impact Statements associated with dredging and monitoring dump sites for spoils.

## GOVERNMENT INVENTIONS FOR LICENSING

### Mechanical Devices and

Equipment. . . . . Techniques associated with design and evaluation of torpedos and handling systems; acoustic sensors and oceanographic data collection devices.

Chemistry. . . . . Battery techniques.

Instruments. . . . . An acoustic ships speed indicator is available for licensing.

Optics and Lasers. . . . . Helix Pitch Monitor is available for licensing.

## INDUSTRIAL AND MECHANICAL ENGINEERING

Environmental Engineering. . . . Environmental testing.

## APPLICATION AREA

## EXPERTISE

Nondestructive Testing . . . . . Shock and vibration testing and simulated explosive shock.

## LIBRARY AND INFORMATION SCIENCES

Information Systems. . . . . Management information systems, computer library management system and data bank.

Reference Materials. . . . . Information storage and rapid retrieval systems; master control computer program, or line literature searching.

## MATERIALS SCIENCES

Ceramics Refractories and Glass. . . . . Extensive experience in use of piezoelectric ceramics for use in underwater hydrophones and transducers.

## MATHEMATICAL SCIENCES

Operations Research. . . . . Models, game theory, programming and flows.

General. . . . . Field and group theory, multilinear algebra, complex variables, Fourier analysis, functional analysis, Euclidean geometry, topology, set theory, statistical analysis.

## NAVIGATION, GUIDANCE, AND CONTROL

Control Devices and Equipment. . Fire control systems.

Guidance Systems. . . . . Torpedo guidance systems.

Navigation Systems . . . . . Range facilities for underwater tracking of ships and weapons and accuracy measurements of navigational systems.

## OCEAN TECHNOLOGY

Marine Engineering . . . . . Underwater system design and deployment technology.

## APPLICATION AREA

## EXPERTISE

- Dynamic Oceanography . . . . . Modeling of ocean parameters especially those which affect acoustic propagation.
- Physical and Chemical  
Oceanography . . . . . Studies and support of acoustic modeling programs.
- Biological Oceanography. . . . . Studies to determine impact of biological matter or acoustic propagation.
- Oceanographic Vessels,  
Instruments and Platforms. . . Facilities in Newport, New London, Bermuda and Ft. Lauderdale.

## ORDNANCE

- Underwater Ordnance. . . . . Development of torpedos with underwater demolition capability.

## PHOTOGRAPHY AND RECORDING DEVICES

- Holography . . . . . Holographic evaluation of vibrating systems.
- Photographic Techniques and  
Equipment. . . . . Extensive capability especially in underwater photography.
- Recording Devices. . . . . Extensive capability in collection of both analog and digital data especially from acoustic sources,

## PHYSICS

- Acoustic . . . . . Extensive capability in underwater acoustics; sonar systems, both active and passive with acoustic communication.
- Fluid Mechanics. . . . . Research facilities for measuring flow noise induced by fluid flow.
- Optic and Lasers . . . . . Optics laboratory for laser and electro-optic R&D as well as application of lasers to signal processing.

APPLICATION AREA

EXPERTISE

Structural Mechanics . . . . . Finite element analysis of complex structures.

Radio Frequency Waves. . . . . Propagation studies.

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Education. . . . . Computerized vocational education model.

Energy . . . . . Solar energy, energy conservation.

Environment . . . . . Preservation of near shore environment, oil on water sensors.

Police, Fire and Emergency

Services . . . . . Asset management system, records management system, fuel dispensing system, emergency communications, speech scramblers.

Transportation . . . . . Life cycle costing, self cancelling ticket, traffic management guide.

General . . . . . Full-Time Technology agent on IPA assignments to state and local government agencies.

CONTACT:

Dr. James Atkinson  
Naval Underwater Systems Center  
Code 0702, Bldg. 80T  
New London, Connecticut 0620  
Telephone: (203) 442-0771 ext. 2908



NIGHT VISION & ELECTRO-OPTICS LABORATORIES  
Fort Belvoir, Virginia 22060

APPLICATION AREA

EXPERTISE

COMPUTERS, CONTROL AND INFORMATION  
THEORY

Image Processing . . . . . Image enhancement techniques, target  
cueing, infrared target/background  
data base library.

DETECTION AND COUNTERMEASURES

Infrared Detection . . . . . Ground devices for individual use or  
vehicle use; airborne systems for  
mapping or aviator maintenance.

Optical Detection. . . . . Searchlights visible use or as aid to  
night vision devices.

Personnel Detection. . . . . Detection of personnel by use of  
image intensifier or infrared devices.

ELECTROTECHNOLOGY

Optoelectronic Devices . . . . . Visual, infrared.

Semiconductor Devices. . . . . Integrated circuits.

MATERIALS SCIENCES

Ceramics, Refractories, and  
Glass. . . . . Fiber optics, micro channels, glass  
substrates.

Coatings, colorants and  
Finishes . . . . . Optical equipment.

PHOTOGRAPHY AND RECORDING DEVICES

Photographic Techniques and  
Equipment. . . . . Capability to record target signatures/  
radiometric data recording.

Recording Devices. . . . . Night vision field and laboratory  
devices for visual and infrared  
systems.

APPLICATION AREA

EXPERTISE

PHYSICS

Optics and Lasers. . . . .	Theory, Design of optical equipment, optical test equipment for visual through infrared spectrums.
Solid State Physics. . . . .	Electro-optical materials (receivers/detectors, emitters).

PROBLEM SOLVING INFORMATION FOR  
STATE AND LOCAL GOVERNMENTS

Police, Fire and Emergency Services . . . . .	Night vision devices.
Environment. . . . .	Detection of pollution.

URBAN AND REGIONAL TECHNOLOGY  
DEVELOPMENT

Fire Services, Law Enforcement and Criminal Justice . . . . .	Night vision devices.
General. . . . .	Any need or application to enhance the vision process thru electro-optics.

CONTACT:  
Richard W. Fulton  
USA Night Vision Laboratory  
ATTENTION: AMSEL-NV-D  
Fort Belvoir, Virginia 22060  
Telephone: (703) 664-3923  
Autovon: 354-3923

NAVAL WEAPONS CENTER  
CHINA LAKE, CALIFORNIA 93555

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ADMINISTRATION</u>	
Computer Application . . . . .	(PERT) planning/control, budget tracking/control; design/maintain/apply configuration and material support system (CADMSS).
Inventory Control. . . . .	Establish/manage supply support in military standard areas; computer control of propellant inventory; major and minor plant equipment, plant account, explosives, material control.
Management Practice. . . . .	Performance Evaluation; conduct data requirements review analysis for proposals; conduct change control systems (Military Standard Area) R&D management analysis, computer and mathematical analysis; cost analysis; evaluation of propellant laboratory performance.
Management Information . . . . .	Bimonthly status/financial project reports; zero base budgeting, equipment management, budgeting, accounting, other techniques to direct plans and controls of propellant loading and mixing including evaluation of results.
Personnel Management, Labor Relations and Manpower Studies. . . . .	Quarterly manpower projections; utilization and evaluation of personnel including cost analysis, manpower requirements; utilization and validation workload analysis; project management training sources.
Research Program Administration and Technology Transfer. . . . .	Metallurgical research program administration; project engineering; program planning; R&D research management,

## APPLICATION AREA

## EXPERTISE

### Research Program Administration and Technology Transfer

(contd). . . . . development, planning and forecasting;  
contract monitoring and management;  
identification of propellant, explosive,  
structural research needs and technical  
problem areas, technology transfer  
programs.

## AERONAUTICS AND AERODYNAMICS

Aeroballistics . . . . . Missile, airframe, control, propulsion  
analysis leading to system simulations;  
gun exterior ballistics -- test, com-  
puter simulations; analytical.

Aerodynamics . . . . . Missile, airframe, control, propulsion  
analysis leading to system simulations;  
preliminary design -- simulation wind  
tunnel experimentation; flight char-  
acteristics and problems of rocket  
motors, structural material analysis,  
aerodynamic stability; aerothermo-  
dynamics; load bearing materials for  
weapons application; aerodynamic config-  
uration of weapon loads.

Aeronautics. . . . . Flight testing of rocket motors, dynam-  
ics, stability, control of propellant  
load, evaluation.

Aircraft . . . . . Aircraft wiring design; weapon system  
integration with aircraft systems; aero-  
dynamics, stores separation, structural  
analysis; remotely piloted vehicles,

Parachutes and Decelerators. . . Parachute development design and test  
expertise; inlet/vehicle body inter-  
actions; drag stability; design, devel-  
opment and testing of vertical seeking  
escape seat.

Avionics . . . . . Radar warning receiver and weapon  
control avionics; weapon systems.

Test Facilities and  
Equipment. . . . . Evaluation capabilities for captive  
or free flight testing of airborne  
equipment; capabilities for testing

## APPLICATION AREA

## EXPERTISE

Test Facilities and  
Equipment (contd). . . . . structural statics and dynamics; spe-  
cialized test equipment and clean room  
for precision gyros, infrared detectors,  
coolers; special test equipment and sta-  
tions for infrared missile guidance;  
optical test equipment and facilities;  
automatic (computer controlled) test  
equipment with design and programming  
options; projectile testing; high tem-  
perature air flow facility; altitude  
chamber; interior ballistics testing;  
light tunnel; chemistry labs; explosive  
and pyrotechnic testing; airbreathing  
engine and component testing facility  
to determine effects of spills of  
energetic liquid fuels, such as lique-  
fied natural gas (LNG).

General. . . . . Prepare/review documentation in mili-  
tary standard areas.

## AGRICULTURE AND FOOD

Agricultural Chemistry . . . . . Latex soil stabilization.

Agricultural Economics . . . . . Hydroculture in geothermal fluids.

General. . . . . Systems analysis.

## ATMOSPHERIC SCIENCES

Meteorological Data Collection,  
Analysis and Weather  
Forecasting. . . . . Instrumenting and operating airborne  
systems for atmospheric data collec-  
tion.

Monitoring . . . . . Atmospheric conditions and air qual-  
ity; wind siting experimentation and  
analysis.

General. . . . . Atmospheric distribution of exhaust  
products from exhaust launches; effects  
of geothermal emissions on local  
weather.

## APPLICATION AREA

## EXPERTISE

### BEHAVIOR AND SOCIETY

Job Training and Career  
Development. . . . . On the job training, technician training, junior professional training and tours; job rotation and specialized short/long term complementary education; technical and managerial training.

### BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING

Biomedical Instrumentation  
and Bioengineering . . . . . Cell colony counting instrumentation.

Life Support Systems . . . . . Protection for aviators against terminal ejection hazards through improved ejection methods.

### BUILDING INDUSTRY TECHNOLOGY

Architectural Design and  
Environmental Engineering. . . Low energy structures program.

Structural Analyses. . . . . General capability; analysis and testing of ship compartments; structural reaction to fire and missile impact; design work for U. S. Coast Guard.

### BUSINESS AND ECONOMICS

General. . . . . Weapon system cost modeling; system analysis studies; energy economics - trade-offs, paybacks, etc.

### CHEMISTRY

Analytical Chemistry . . . . . Metals analysis and general materials analysis capability; gas chromatography; mass spectrometry; infrared spectroscopy; techniques and instrumentation for analysis of trace elements, individual compounds or specific groups of compounds; included are qualitative, volumetric, gravimetric, optical, methods; complete facilities for solid and liquid propellant analysis.

## APPLICATION AREA

## EXPERTISE

- Basic and Synthetic Chemistry. . Capabilities for synthesizing propellant and explosive formulations.
- Industrial Chemistry and  
Chemical Process  
Engineering. . . . . Processing and handling of high sensitivity explosives; fuel-air explosive weapons manufacture; plants and process technology; cook-off and burn point testing and investigation.
- Photo and Radiation Chemistry. . Pyrotechnics; infrared decoy flares; analysis of laser reaction and degradation with propellant mixes.
- Physical and Theoretical  
Chemistry. . . . . Kinetics; spectroscopy; photochemistry; rocket plume dynamics; study chemical reaction rates of propellants in natural atmosphere; molecular structure, chemical thermodynamics, theoretical molecular dynamics and molecular structure.
- Polymer Chemistry. . . . . Polymer research and development capability; polymer characterization, combustion, monitoring, coatings, adhesives, composites and polymer mechanics.
- General. . . . . Propellant engineering; organic chemistry.

## CIVIL ENGINEERING

- Construction Equipment,  
Materials and Supplies . . . . Latex modified concrete.
- Soil and Rock Mechanics. . . . . Soil stabilization.

## COMMUNICATION

- Communication and Information  
Theory . . . . . Coding, spread spectrum techniques; analysis, design and evaluation skills; command and control system programming and analysis; data busses; submarine radio and external communications systems.

## APPLICATION AREA

## EXPERTISE

Graphics . . . . . Computer interactive graphics system specification and operation; graphic display capability for use in data analysis as well as system configuration experiments.

Radio and Television  
Equipment. . . . . Development efforts to reduce video image smear of fast-moving objects; digitizing of the video frame for direct input to computers for assessment.

## COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Mini computer, including microprocessor applications, math modeling; programming, compilers, numerical analysis; data base systems; performance modeling and analysis; data management; management information.

Computer Software. . . . . Microprocessor system design; missile and avionics software; radar simulation; programming analog, digital and hybrid computers for analysis, modeling and complex simulation; laser eye safety analysis; software packages for special purpose and dedicated computers.

Control Systems and Control  
Theory . . . . . Applied to air-to-ground guided missiles; adaptive autopilots and control systems; computer control of guidance, radar, positioning; feed back and control systems for gyro and servo control pneumatic, electric and hydraulic servo flight control systems; determination of static and dynamic characteristics; control system design and development and testing; surface weapon propellant; system control integration.



## APPLICATION AREA

## EXPERTISE

### Information Processing

Standards. . . . . Standards to provide for economic and effective use of automated data, processing equipment and systems, including hardware, software, applications and data.

### Pattern Recognition and

Image Processing . . . . . Electro-optic; infrared; radio frequency processing techniques; feature extraction and enhancement; character recognition.

## DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . . Sea mine sensors of all types; ultra-high frequency acoustic data transmission for fire and damage control aboard ships; noise monitoring; acoustic silencing of submarines.

### Electromagnetic and Acoustic

Countermeasures. . . . . Anti-radiation missile countermeasures; simulation and test; electronic warfare and analysis test; mine countermeasures.

### Infrared and Ultraviolet

Detection. . . . . Advanced IR detectors and detection techniques; IR countermeasures, IR signature measurements, modeling and analysis; IR detector material development and device fabrication; IR decoy flares and instrumentation; relation to propulsion sensitivity.

Magnetic Detection . . . . . Sea mine sensors; active and passive techniques for intrusion and metal detection applications.

Optical Detection. . . . . Advanced electro-optic detection techniques including pyroelectric vidicons and charged-coupled device detectors.

Personnel Detection. . . . . Personnel detection in foliage.

## APPLICATION AREA

## EXPERTISE

Radio Frequency Detection. . . . Broadband direction finding systems; antennas, receivers, processors, millimeter wave radar; active and semi active RF seekers; facilities (instruments and anechoic chambers) exist for the design and test of low-power microwave systems and components.

## ELECTROTECHNOLOGY

Antennas . . . . . Broadband antennas and microwave arithmetic feed circuits; advanced missile, fire control and RF surveillance antenna systems; design and development using advanced technology.

Circuits . . . . . Digital/analog design, microwave (strip-line/microstrip), electronic circuit design; advanced solid state circuitry; hybrid microelectronic devices, integrated circuits; related to missile propulsion.

Electromechanical Devices. . . . Servo system design; advanced electromechanical control systems; design and evaluation of gyros, solenoids, high pressure valves, motors, pumps, servo valves, accelerometer, pressure transducers, gas generators; devices used in feasibility demonstrations of propulsion work; development, test, failure analysis.

Electron Tubes . . . . . Magnetrons and HV power supplies.

Optoelectronic Devices and  
Systems. . . . . Multilayer thin film optical filter synthesis, analysis and fabrication; optical and electro-optical system design.

Power and Signal Transmission  
Devices. . . . . Microwave power combiners and modulators; ignitor and impulse signals for propellant ignition.

## APPLICATION AREA

## EXPERTISE

Semiconductor Devices. . . . . High power solid-state microwave combiners; hybrid integrated circuits, fabrication and failure analysis; solar cell application.

General. . . . . Component reliability technology; quality assurance support.

## ENERGY

Batteries and Components . . . . . Power system analysis design and test evaluation; primary battery process technology; especially thermal battery silver zinc manufacturing technology.

Electric Power Production. . . . . Solar cell application studies and hardware; geothermal power production; solar electric generators.

Energy Use, Supply and  
Demand . . . . . Energy survey and monitoring of Navy bases; self-sufficiency analysis.

Environmental Studies. . . . . Geothermal related environmental studies; corrosion studies; studies to determine environmental and safety hazards of energetic liquid fuels such as liquified natural gas (LNG).

Fuel Conversion Process . . . . . Conversion of solid trash to polymer gasoline.

Fuels. . . . . Production, performance, storage, of all types of solid, liquid and gaseous fuels; alternate fuels development.

Geothermal Energy. . . . . Exploration techniques; utilization techniques.

Policies, Regulation and  
Studies. . . . . Geothermal legal institutional studies.

Solar Energy . . . . . Photovoltaic application studies and analysis.

General. . . . . General analysis studies.

## APPLICATION AREA

## EXPERTISE

### ENVIRONMENTAL POLLUTION AND CONTROL

- Air Pollution and Control. . . . Clean room, air cleanliness monitoring; experience in air quality monitoring.
- Noise Pollution and Control. . . Experience in noise monitoring.
- Solid Wastes Pollution and Control. . . . . Conversion of cellulose waste to polymer gasoline; experience in monitoring; control from propellant processing, mixing and extrusion.
- Water Pollution and Control. . . Experience in monitoring and control.
- Radiation Pollution and Control. . . . . Design and test capability for microwave (non-ionizing radiation); microwave safety committee member.
- Environmental Health and Safety . . . . . General applications to health and safety standards.
- Environmental Impact Statement. . . . . Experience in coordination with all agencies on environmental matters and experience in writing statements.

### GOVERNMENT INVENTIONS FOR LICENSING

- General. . . . . Proximity and contact sensing safety-arming devices for warheads and rocket motors.

### INDUSTRIAL AND MECHANICAL ENGINEERING

- Environmental Engineering. . . . General environmental engineering and analysis; modification and maintenance of equipment and controls.

## APPLICATION AREA

## EXPERTISE

Hydraulic and Pneumatic Equipment. . . . .	Experience as related to weapon systems and test equipment; high pressure hydraulic component and system design, development and test; servo valve test- ing.
Industrial Safety Engineering. . . . .	Propellant.
Job Environment. . . . .	Developed working environment require- ment (military standard).
Manufacturing Processes and Materials Handling . . . . .	Materials processing technology; sol- dering technology and printed wiring processing; propellant storage and handling; chemical processing; fabri- cation techniques and thermionic and solid state device processing.
Nondestructive Testing . . . . .	Missiles and avionics; nondestructive evaluation laboratory; X-ray scanning electron microscope; electrical, thermal cycling; propellants and propulsion structure; shock and vibration testing.
Production Planning and Process Controls . . . . .	Development of hand soldering/machine soldering requirements and quality control methods; development of con- trols for checking solvent removal processes of ionic contaminants; sampling techniques, modeling tech- niques and program controls; opera- tional controls.
Plant Design and Maintenance. . . . .	Feasibility studies, such as site selection, layout of utilities.
Quality Control and Reliability . . . . .	Missiles and avionics; quality control testing; complete production, quality assurance, and reliability support capability.

## APPLICATION AREA

## EXPERTISE

Tooling, Machinery and  
Tools. . . . . Jigs, fixtures and die molds for producing special designed parts and assembling parts.

General. . . . . System safety support.

## LIBRARY AND INFORMATION SCIENCE

Information Systems. . . . . Management information systems; data base management; current awareness of information retrieval.

Marketing and User Services. . . . . Marketing concepts, background planning, presentation and development.

Reference Materials. . . . . Technical library.

## MATERIALS SCIENCES

Ablative Materials and  
Ablation . . . . . Solid ramjet fuels; high temperature insulation, low cost ablative materials, development and characterization.

Adhesives and Sealants . . . . . Plastics laboratory; development and characterization of structural adhesives and sealants.

Carbon and Graphite. . . . . Mechanical properties, metallurgical laboratory; fuel technology based on these materials.

Ceramics, Refractories and  
Glass. . . . . Cements, glasses, brick.

Coatings, Colorants and  
Finishes . . . . . Coatings and finishes specialists; experience with special coatings for filtering, corrosion resistance, wear resistance and reflective characteristics; conformal coating, solder mask, electro-plating.

Composite Materials. . . . . Mechanical properties, metallurgical laboratory; bonded propellants.

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## APPLICATION AREA

## EXPERTISE

Corrosion and Corrosion Inhibition . . . . .	Materials engineering; materials compatibility with liquid propellants and resistant to corrosion.
Elastomers . . . . .	National parachute test range capabilities; mechanical and physical testing of sealants.
Fibers and Textiles. . . . .	Reinforcing agents.
Iron and Iron Alloys . . . . .	Materials engineering; special application for nonmagnetic, high pressure air systems; gun barrel analysis in conjunction with projectile rounds.
Lubricants and Hydraulic Fluids . . . . .	Analytical chemistry; for special precision bearings (type of lubricants, application, amount of lubrication, etc.); chemical, mechanical and physical properties, fire resistance.
Materials Degradation and Fouling. . . . .	Analytical chemistry; aging, erosion, wear, weathering, deterioration, decay; effects of radiation on materials, corrosion and inhibition; embrittlement.
Miscellaneous Materials. . . . .	Materials engineering; polymer concrete.
Nondestructive Testing . . . . .	Materials engineering; part screening and preconditioning technology.
Nonferrous Metals and Alloys . . . . .	Materials Engineering; mechanical properties.
Plastics . . . . .	Materials engineering; physical and mechanical properties performance and production, including stabilizers fillers and curing agents, casting; injection.

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
Refractory Metals and Alloys . . . . .	Materials engineering.
Solvents, Cleaners and Abrasives. . . . .	Application and method for use of cleaners, solvent for removal of polar-nonpolar contaminants and flux.
<u>MATHEMATICAL SCIENCES</u>	
Analysis (Mathematics) . . . . .	Advanced mathematical analysis, modeling and computer simulation of complex systems; reliability prediction and methodology; analysis and simulations of physical and chemical processes; general.
Mathematical Logic . . . . .	General.
Operations Research. . . . .	Advanced war game techniques with computer simulation; formulation, injection and molding; analytical evaluations; computer simulations; general.
Statistical Analysis . . . . .	Reliability assessments; (experimental and variances) concepts, data design criteria, predictions and analysis techniques; general use and expertise.
General. . . . .	Systems analysis and simulation of electronic warfare and defense suppression system; electronic warfare operational analysis.
<u>MEDICINE AND BIOLOGY</u>	
Toxicology . . . . .	Toxicity of propellants.
<u>NATURAL RESOURCES AND EARTH SCIENCES</u>	
Soil Sciences. . . . .	Soil stabilization with latex emulsions.

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## APPLICATION AREA

## EXPERTISE

### NAVIGATION, GUIDANCE AND CONTROL

#### Control Devices and

Equipment. . . . . Automatic air vehicle control and recovery guidance; quality assurance systems safety and reliability development and production support capability.

Guidance Systems . . . . . Radio frequency direction finding; advanced control systems for missiles, drone aircraft, remote controlled vehicles, self-ejecting ejection seats and vertical launch systems; extensive experience and capability in automated and semiautomated guidance systems, control systems and devices, signal processing (detectors, gyros, optical gyroscopic telescopes, servo control systems, signal processing) design and test/evaluation capability for radar (microwave) systems and their subsystems.

#### Navigation and Guidance System

Components . . . . . Microstrip, stripline, components and networks.

General. . . . . Advanced electro-optic, infrared and radio frequency tactical missile guidance and navigation systems, autopilots, general.

### OCEAN TECHNOLOGY AND ENGINEERING

#### Marine Geophysics and

Geology. . . . . Extensive experience in design and fabrication of machinery and equipment for deep ocean environments; hydrazine gas generators.

#### Oceanographic Vessels,

Instruments and Platforms. . . . . Experience in design and construction of deep ocean research submarines.

## APPLICATION AREA

## EXPERTISE

### ORDNANCE

Ammunition, Explosives and  
Pyrotechnics . . . . .

Safety and arming of a wide variety of Naval ordnance; design, evaluation, documentation of sensitive explosive leads, detonators, and boosters; can prepare and handle, test, load and fire fleet issue guns, rockets and missiles from ground launchers; also these items plus bombs for air launchers; flares, gun propellants; fuel-air explosive fuels; perform research and development and test and evaluation on warheads, explosive systems and conventional weapon systems.

Bombs. . . . .

Prepare bombs for air launch; fuel air explosive fuels; perform research, development, test and evaluation of warheads, explosive systems, and conventional weapon systems.

Combat Vehicles . . . . .

General.

Detonations, Explosion Effects  
and Ballistics . . . . .

Fuel air explosives; perform research, development, test, and evaluation of warheads, explosive systems, and conventional weapon systems.

Fire Control and Bombing  
Systems. . . . .

Advanced shipboard missile and gun fire control systems.

Guns . . . . .

Prepare, handle, test, load and fire fleet issue guns; liquid propellant guns; gun propellants; interior ballistics.

Rockets. . . . .

Prepare, handle, test, load and fire fleet issue rockets; fuels; propellants.

Underwater Ordnance. . . . .

General.

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## APPLICATION AREA

## EXPERTISE

General. . . . . Development and production; reliability support; quality assurance system safety; missile propulsion (rockets, ramjets and turbojets).

## PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . . Holographic structural analysis.

## PHYSICS

Acoustics. . . . . Acoustical sensor applications.

Optics and Lasers. . . . . Waveguide laser technology and applications; range measuring devices; synthesis, analysis and fabrication of low loss multilayer thin film optical coatings.

Solid State Physics. . . . . Solid state circuitry and electro-mechanical components; piezoelectric materials growth.

Structural Mechanics . . . . . Missile structure design and analysis, aeromechanics and aerodynamics of missiles using LED and laser diodes.

Radio Frequency Waves. . . . . RF device technology development; sea surface RF scatter modeling.

General. . . . . Computations and analysis as applies to propulsion propellants and rocket motors.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Energy . . . . . Studies in the areas of transportation of energetic liquid fuels.

Police, Fire and Emergency Service. . . . . Ranging communication systems.

APPLICATION AREA

EXPERTISE

General. . . . . Technology transfer; fire hazard and safety; life saving equipment for fire-fighters.

TRANSPORTATION

Marine and Waterway

Transportation . . . . . Studies in transportation of energetic liquid fuels.

Railroad Transportation. . . . . Transportation of energetic liquid fuels.

Road Transportation. . . . . Transportation of energetic liquid fuels.

General. . . . . Vehicles.

CONTACT: Mr. G. F. Linsteadt  
Naval Weapons Center  
China Lake, CA 93555  
Telephone (714) 939-7325

NAVAL WEAPONS SUPPORT CENTER  
CRANE, INDIANA 47522

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Management Practice. . . . .	Cost effectiveness, management analysis.
Management Information Systems. . . . .	Perform system analysis studies and develop automatic reporting systems to assist management in establishing and directing plans.
Personnel Management, Labor Relations, and Manpower Studies. . . . .	Manpower allocation, utilization, validation and requirements; resources planning.
Research Program Administration and Technology Transfer. . . .	Identification and communication of research needs and technical problem areas.

AERONAUTICS AND AERODYNAMICS

Parachutes and Decelerators . . . . .	Drag parachutes, aerodynamic decelerators, design/development.
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ATMOSPHERIC SCIENCES

Weather Modification . . . . .	Pyrotechnic devices for cloud seeding, weather modification, etc.
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BEHAVIOR AND SOCIETY

Organizational Psychology . . . . .	Personnel interactions, behavior, adjustment, motivation, psychology, and psychometrics.
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<u>BUILDING TECHNOLOGY.</u> . . . . .	Expertise relevant to all subcategories.
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## APPLICATION AREA

## EXPERTISE

### CHEMISTRY

Analytical Chemistry . . . . . Complete analytical capabilities and associated instrumentation.

Industrial Chemistry and  
Chemical Process  
Engineering. . . . . Process/unit operations and equipment concerned with chemical processing and storage.

Basic and Synthetic  
Chemistry. . . . . Inorganic and organic reactions, molecular structure.

Photo and Radiation  
Chemistry. . . . . Particle radiation and chemical reactions, radio-chemistry.

Physical and Theoretical  
Chemistry. . . . . Reaction kinetics, chemical equilibria/thermodynamics, reaction mechanisms, etc.

CIVIL ENGINEERING. . . . . . Capabilities in all subcategories.

### COMMUNICATION

Radio and Television  
Equipment. . . . . Design/maintenance of television and receiving equipment.

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Hardware. . . . . Design, component selection, test and fabrication.

Computer Software. . . . . Programming in INCOBAL, FORTRAN, PL/I, BAL, EASYCODER, GPSS, etc.

Control Systems  
and Theory . . . . . Design, development, component selection, test and fabrication.

Information Processing  
Standards. . . . . Standards for hardware, software, applications and data.

## APPLICATION AREA

## EXPERTISE

Information Theory . . . . . Studies concerned with measurement/  
transmission of information in a  
communication channel.

## DETECTION AND COUNTERMEASURES

Electromagnetic and Acoustic  
Countermeasures. . . . . Development and test/evaluation.

Optical Detection. . . . . Detection by means of light including  
night vision devices.

Radiofrequency  
Detection. . . . . Detection/tracking using transmitted/  
reflected radio-frequency waves.

## ELECTROTECHNOLOGY

Antennas . . . . . Measurement, test/evaluation for  
parameters such as pattern, impedance,  
intensity principally for over-the-  
water capabilities.

Circuits . . . . . Circuit and module theory, design,  
development, fabrication, and test/  
evaluation.

Electromechanical  
Devices. . . . . Development, test, specifications,  
and failure analysis.

Electron Tubes . . . . . General capabilities.

Optoelectric Devices and  
Systems. . . . . Development, component application  
and test/failure analysis.

Power and Signal  
Transmission Devices . . . . . Specifications, test/evaluation.

Resistive, Capacitive, and  
Inductive Components . . . . . Development, specifications, test,  
application and failure analysis  
for basic components.

## APPLICATION AREA

## EXPERTISE

Semiconductor Devices. . . . . Development, complete evaluation and product assurance capability, specifications, application, and failure analysis.

Electromagnetic Effects. . . . . Test/evaluation, engineering analysis of equipment to determine emissions and effect of electromagnetic energy.

ENERGY . . . . . Capabilities in all general sub-category areas.

## ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Sampling and analytical techniques, general expertise in air pollution control.

Noise Pollution and Control. . . . . Capabilities in all general areas.

Solid Wastes Pollution and Control. . . . . Disposal of solid chemicals by composting and soil disposal; processing for separation and materials recovery; utilization; recycling; liquid disposal.

Water Pollution and Control. . . . . Testing, photo degradation of waste chemical pollutants.

Environmental Health and Safety . . . . . Toxicology, industrial health.

## HEALTH PLANNING

Environmental and Occupational Factors. . . . . Safety hazards related to pyrotechnics and high energy compounds, noise pollution, occupational and industrial hazards.



## APPLICATION AREA

## EXPERTISE

### INDUSTRIAL AND MECHANICAL ENGINEERING

Production and Process Controls . . . . .	General capabilities in all planning and control areas.
Quality Control and Reliability. . . . .	Total capability for electronic and ordnance devices/equipment.
Plant Design and Maintenance. . . . .	Plant layout, utilities, tooling techniques.
Job Environment. . . . .	Limited applied research capability related to job environment parameters.
Environmental Engineering. . . . .	Design/maintenance of lighting and temperature controls, air conditioning, cooling systems, etc.
Tooling, Machinery, and Tools. . . . .	Expertise in all general areas.
Manufacturing Processes. . . . .	Capabilities in all related areas.
Non-Destructive Testing. . . . .	Ultrasonic, radiographic, and hydrostatic test and evaluation facilities/capability.

### MATERIALS SCIENCES

Ceramics, Refractories, and Glass. . . . .	General expertise.
Coatings, Colorants, and Finishes . . . . .	Coatings and finishes.
Corrosion and Corrosion Inhibition . . . . .	Complete facilities for research, development, and test/evaluation related to corrosion and prevention.
Elastomers . . . . .	Complete evaluation and testing capability.

## APPLICATION AREA

## EXPERTISE

Iron and Iron Alloys . . . . .	Complete lab capability for analysis, test and evaluation.
Lubricants and Hydraulic Fluids . . . . .	Test and analysis capability.
Materials Degradation and Fouling. . . . .	Complete evaluation and test facilities, particular expertise in material biodeterioration.
Nonferrous Metals and Alloys . . . . .	Complete analysis, test and evaluation capability.

## MATHEMATICAL SCIENCES

Algebra and Number Theory . . . . .	Field, group, and number theory, theory of equations.
Analysis (Mathematical). . . . .	Calculus, calculus of variations, complex variables, differential equations, measure/integration and mathematical functions.
Operations Research. . . . .	Complete operations research capability.
Statistical Analysis . . . . .	Complete statistical analysis capability.

## MEDICINE AND BIOLOGY

Microbiology . . . . .	Microbial physiology, microbiology of materials.
Toxicology . . . . .	As related to explosives and industrial chemistry only.

## NATURAL RESOURCES

Natural Resource Management . . . . .	Fish and wildlife management; conservation and management of land, water, forest.
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## APPLICATION AREA

## EXPERTISE

Forestry . . . . . Protection and management, harvesting, logging.

## NAVIGATION, GUIDANCE

AND CONTROL. . . . . General capabilities for the four subcategory areas in design, development, test and evaluation of components, modules and equipment.

## NUCLEAR SCIENCE AND EQUIPMENT

Nuclear Explosions and  
Devices. . . . . Radiation testing, hardening, and effects.

## ORDNANCE

Ammunition, Explosives,  
and Pyrotechnics . . . . . Complete capability including design, development, failure/safety analysis, quality assurance, test/evaluation and production.

Bombs. . . . . Quality assurance for bomb type devices.

Combat Vehicles. . . . . Repair, overhaul.

Detonations, Explosive Effects  
and Ballistics . . . . . Study of motion, behavior, and aerodynamics of projectiles thrown or launched by ordnance projectors.

Fire Control and  
Bombing Systems. . . . . Design, development, test, and fabrication.

Guns . . . . . Overhaul, repair of guns, and related hardware/equipment, small arms design/development, test and evaluation.

Underwater Ordnance. . . . . Quality assurance; limited design/development capability.

## APPLICATION AREA

## EXPERTISE

### PHOTOGRAPHY AND RECORDING DEVICES

Photographic techniques  
and Equipment. . . . . Capabilities in essentially all  
areas.

Recording Devices. . . . . Capabilities in essentially all  
areas.

### PHYSICS

Acoustics. . . . . General capability.

Optics and Lasers. . . . . Design/development of optical  
equipment; electromagnetic waves.

Structural Mechanics . . . . . General capability.

#### CONTACT:

C. D. Robinson  
Naval Weapons Support Center  
Director, Applied Sciences  
Department (Code 50)  
Crane, Indiana 47522  
Telephone: (812) 854-1282 or 1358  
Autovon 482-1282

OAK RIDGE NATIONAL LABORATORY  
Oak Ridge, Tennessee 37830

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>BEHAVIOR AND SOCIETY</u> . . . . .	Regional Resource Analysis.
<u>BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING</u>	
Bioengineering . . . . .	Biophysics and bioengineering.
Human Factors Engineering. . . .	Effects of energy technology.
<u>ENERGY</u>	
Miscellaneous Energy Conversion and Storage. . . . .	Toroidal fusion reactor concepts; neutral beam injection; superconducting magnet development, tritium handling.
Energy Use, Supply and Demand . . . . .	Improved materials and controls; appliance and insulation standards; energy use modeling.
Solar & Geothermal Energy . . . . .	Low Temperature Heat Transfer; environmental assessments.
Fuel Conversion Processes. . . .	Coal conversion and combustion engineering; high efficiency thermal conversion; chemical and physical properties of coal.
General. . . . .	Materials research; nuclear sciences; molecular science, heavy ion research.
Nuclear Energy Development. . . . .	Fuel Cycle Research and Development Reactor Safety Research Breeder Reactor Development.
Fusion Energy Development. . . . .	Toroidal Fusion Reactor Concepts Neutral Beam Injection Superconducting Magnet Development Tritium Handling.

## APPLICATION AREA

## EXPERTISE

Fossil Energy. . . . . Coal Conversion & Combustion Engineering High-Efficiency Thermal Conversion Chemical and Physical Properties of Coal.

Conservation . . . . . Improved Materials and Controls Appliance and Insulation Standards Energy Use Modeling.

## ENVIRONMENTAL POLLUTION AND CONTROL

Environmental Health and Safety . . . . . Environmental Effects of Energy Technology Toxicology, Carcinogenesis, Mutagenesis and Teratology. Biophysics and Bioengineering Environmental Policy Analysis.

## MEDICINE AND BIOLOGY

Toxicology . . . . . Toxicology, carcinogenesis, mutagenesis and teratology.

## NUCLEAR SCIENCE AND TECHNOLOGY

General. . . . . Fuel cycle research and development; reactor safety research; breeder reactor development.

### CONTACT:

Mr. Donald Jared  
TU/C  
Oak Ridge National Laboratory  
P.O. Box X  
Oak Ridge, TN 37830  
Telephone: (615) 483-8611, ext. 30121

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION  
Forest Service, USDA  
Portland, Oregon

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology  
Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:  
Eldon Estep  
Planning and Application AD  
Pacific Northwest Station  
U.S. Forest Service  
809 NE 6th Avenue  
Box 3141  
Portland, Oregon 97208  
Telephone: (503) 234-3361

PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION  
Forest Service, USDA  
Berkeley, California

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:

Richard L. Hubbard  
Planning and Application AD  
Pacific Southwest Station  
U.S. Forest Service  
1960 Addison Street  
Box 245  
Berkeley, California 94701  
Telephone: (415) 486-3286



U.S. AIR FORCE ROME AIR DEVELOPMENT CENTER  
Griffiss Air Force Base, New York 13316

APPLICATION AREA

EXPERTISE

COMMUNICATION

Communications ECCM. . . . .	Digital tropo ECCM techniques; UHF adaptive antennas; multi-beam phased array; VLF broadband transmission; ECCM voice modem; LORAN C/D ECCM experiments.
All Weather Precision Targeting. . . . .	Target detection location and strike.
Emitter Identification Location and Strike. . . . .	Detection of Emitters.
Communications for Command and Control. . . . .	Communications for command and control, UHF-VLF range.
Information Transmission . . . . .	Intra- and inter-base communications.
Digital Communication Simulation and Experimentation. . . . .	Simulate variety of transmission media to determine range fidelity and capacity.

DETECTION AND COUNTERMEASURES

Surveillance ECCM. . . . .	Development of signal processing and electronic devices as well as associated measurement and simulation techniques.
Active Target Identification and Location . . . . .	Development of techniques for identification of aircraft and space objects; radar signature analysis; radar imaging for aircraft identification.

## APPLICATION AREA

## EXPERTISE

Strategic Target Surveillance . . . . .	Radar Tracking; development and simulation of both tactical and general purpose Air Traffic Control facilities.
Tactical Ground Target Detection and Identification . . . . .	Improved techniques and capabilities for detecting and identifying air and ground tactical targets.
Strategic Targeting. . . . .	Photogrammetric imagery; digital imagery techniques.
Indications and Warning. . . . .	Intelligence data integration and distributed intelligence networks; signal intelligence; technical intelligence.
Information Transmission . . . . .	Development of solid state devices and thermionic tubes suitable for use in transmitters of aerospace data links.
Ground Sensors . . . . .	Development of security alarm sensors for installations, aircraft, etc. to detect intruders.

## ELECTROTECHNOLOGY

Antennas . . . . .	Studies of limited scan antennas resulting in an in-house development of multiple mode apertures for use with limited scan array.
Radio Frequency Components . . . . .	Miniature RF and surface acoustic wave components for small light-weight radios.
Electromagnetic System Concepts	
Radar and RF Sensors . . . . .	New airborne moving target indicator radar concepts and methods of detecting human intruders.

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## APPLICATION AREA

## EXPERTISE

### Radar Target

Characteristics. . . . . Techniques for the identification of military targets such as aircraft and ground vehicles, through radar signature analysis.

### Radar Sensor

Countermeasures. . . . . Use of high energy laser beams for protection of aircraft against missile attack.

### Propagation

Tropospheric . . . . . Investigations of feasibility of using millimeter wavelengths for ground-to-satellite and ground-to-aircraft wide band data links.

Ionospheric. . . . . Establish operational limitations to Air Force communications, surveillance and navigation systems imposed by ionosphere.

Circuits . . . . . Large scale integrated circuit testing, reliability prediction for microwave transistors, microprocessor reliability.

Reliability evaluation of complementary metal oxides technology in complex integrated circuits; large package hybrid microcircuit qualification tests.

Standardization of printed circuit boards; maintainability design of digital systems/equipments; specifications, design guides and standards; printed circuit specifications and standards.

### Electromagnetic

Devices. . . . . Develop analytical tools which will permit the designer to design electromagnetically compatible electronic systems.

## APPLICATION AREA

## EXPERTISE

- Electromagnetic. . . . . Techniques and devices for reducing;  
Devices (Contd.) intermodulation products in collocated transmitters, output noise levels of broadband, solid state transmitters.
- Prepares for DoD all EMC standards.
- Electronic Devices . . . . . Development of advanced solid state device processing technology and application of state-of-art technology to new device concepts.
- Opto-Electronic Device  
Technology . . . . . Optical fiber communications.

## LIBRARY AND INFORMATION SCIENCES

- Requirements Analysis. . . . . Develop standard tools and procedures for specifying requirements to allow verification and tracking for satisfying threat evaluation and functional system prototyping to analyze requirements and perform risk assessments and trade-off studies.
- Disciplines Programming  
Environment. . . . . Test and evaluation of tools and procedures used in R&D and by software contractors; development of standards and requirements for support software; development of standards to improve consistency across the varying design, development, test and maintenance environments.
- Quality Control. . . . . Gather reliable quantitative data on cost software developments including costs to design, produce, test and maintain, and reliability information.
- System Architecture. . . . . Develop facilities, tools and procedures for emulating the full range of architectures for performing hardware/software/firmware total system design trade-offs.

APPLICATION AREA

EXPERTISE

NUCLEAR SCIENCE AND TECHNOLOGY

Radiation Effects

and Hardening. . . . . Hardening of components to withstand  
nuclear radiation.

CONTACT:

Fred N. DiMaggio, Chief, Technical  
Management Branch  
Rome Air Development Center  
Griffiss AFB NY 13441  
Telephone: (315) 330-2973

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ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES  
Alexandria, Virginia 22333

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Personnel Management, Labor  
Relations and Manpower  
Studies. . . . .

Selection, classification, and recruitment of Army personnel; occupational structure, duty modules, task analysis; training management technology.

Research Program Administration  
and Technology  
Transfer . . . . .

Development, review, and conduct of research program, including both in-house and contract effort; administration of grants in behavioral and social sciences; Technical Cooperation Program (international); technical advisory service (within DOD).

BEHAVIOR AND SOCIETY

Job Training and Career  
Opportunities. . . . .

Training automation and simulation; group skill development; on-the-job training; career progression systems; tracking of training technology transfer; policies and processes affecting career commitment.

Organizational  
Psychology . . . . .

Organizational effectiveness technology; OE program evaluation; team building; communication; leader training and evaluation.

Social Concerns. . . . .

Human relations training development and validation; race relations/equal opportunity program management; human resource utilization; role of women in the Army; impact of family variables on soldier productivity.

## APPLICATION AREA

## EXPERTISE

Education, Law,  
and Humanities . . . . . Performance-based training and test-  
ing; self-instructional techniques  
and extension training; unit skill  
development and evaluation.

## COMMUNICATION

Communication and Information  
Theory . . . . . Battlefield information systems;  
man-machine interface; team opera-  
tions with computerized command and  
control systems.

## COMPUTER, CONTROL AND INFORMATION THEORY

Information Processing  
Standards. . . . . Development of computerized infor-  
mation systems for research and  
procedures for data analysis.

### CONTACT:

Dr. R. M. Sasmor  
U.S. Army Research Institute  
5001 Eisenhower Avenue  
Alexandria, Virginia 22333  
Telephone: (202) 274-8636

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION  
Forest Service, USDA  
Fort Collins, Colorado

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:

Jay S. Krammes  
Research and Application AD  
Rocky Mountain Station  
U.S. Forest Service  
240 W. Prospect Street  
Fort Collins, Colorado  
Telephone: (303) 482-7332



SOUTHEASTERN FOREST EXPERIMENT STATION  
Forest Service, USDA  
Asheville, North Carolina

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:

David F. Olson, Jr.  
Planning and Application AD  
Southeastern Experiment Station  
U.S. Forest Service  
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Box 2570  
Asheville, N. C. 28802  
Telephone: (704) 672-0637

SANDIA LABORATORIES  
Albuquerque, New Mexico 87115

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ADMINISTRATION</u>	
Engineering Systems Management . . . . .	Technical management. Fiscal controls. Program direction. Component development. Quality assurance.
<u>AERONAUTICS AND AERODYNAMICS</u>	
Aeroballistics . . . . .	Simulation, design and testing of individual and combinations of weapons and carriers.
Aerodynamics . . . . .	Stability analysis, guidance and control, separation dynamics, flight simulation.
Parachutes and Decelerators . . . . .	Chute design and development, fabric development, flotation and recovery devices.
Test Facilities and Equipment. . . . .	Wind tunnels, flow-field studies, atomic fluid physics, and aerophysics.
General. . . . .	Transport phenomena, heat shield, terradynamics.
<u>ATMOSPHERIC SCIENCES</u>	
Dynamic Meteorology. . . . .	As affected by short term, rapid changes of state.
Physical Meteorology . . . . .	Modeling and testing properties of atmosphere.
<u>BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING</u>	
Biosciences. . . . .	Reactor siting, nuclear risk assessment, sterilization of space probes, sewage sludge treatment.

## APPLICATION AREA

## EXPERTISE

### COMPUTERS, CONTROL AND INFORMATION THEORY

Computer Software. . . . .	Wide use of computers as tools.
Interactive Graphics . . . . .	Product definition augmentation. CAD/CAMS.
Pattern Recognition and Image Processing . . . . .	Use for scientific analysis and as general tool electro-optic materials development.

### DETECTION AND COUNTERMEASURES

Infrared and Ultraviolet Detection. . . . .	Full spectrum of tools and personnel.
Nuclear Explosion Detection. . . . .	Complete capability in all environ- ments.
Personnel Detection. . . . .	Safeguard control.
Seismic Detection. . . . .	Wide range of capabilities and uses.

### ELECTROTECHNOLOGY

Antennas . . . . .	Our expertise covers all specified branches, except power and signal transmission devices.
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### ENVIRONMENTAL POLLUTION AND CONTROL

Solid Wastes Pollution and Control. . . . .	Thermoradiation of sewage sludge for fertilizers and feedstocks.
Radiation Pollution and Control. . . . .	Part of our Safeguards Program.
Environmental Health and Safety . . . . .	A line function over the entire laboratory.

## APPLICATION AREA

## EXPERTISE

Detonations, Explosion Effects,  
and Ballistics . . . . . Full spectrum of capabilities.

Fire Control and  
Bombing Systems. . . . . Full spectrum of capabilities.

## PHOTOGRAPHY AND RECORDING DEVICES

Holography . . . . . Used only as an analytic and  
diagnostic tool.

Photographic Techniques  
and Equipment. . . . . Used only as an analytic and  
diagnostic tool.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Environment. . . . . As evaluated for interaction with  
our projects.

Transportation . . . . . Full line of technology as applied  
to weapon and reactor fuel shipments.

## TRANSPORTATION

Safety . . . . . As one of principal concerns in  
weapon and reactor fuel shipments.

Security . . . . . As one of principal concerns in  
weapon and reactor fuel shipments.

### CONTACT:

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Technology Utilization Program  
Sandia Laboratories - 9636  
Albuquerque, New Mexico 87115  
Telephone: (505) 264-1947, or  
FTS 475-1947

SOUTHERN FOREST EXPERIMENT STATION  
Forest Service, USDA  
New Orleans, Louisiana

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology

Transfer . . . . . Technology transfer.

NATURAL RESOURCES AND  
EARTH SCIENCES

Forestry . . . . . Information on all aspects of  
forestry.

CONTACT:

Nelson S. Loftus, Jr.  
Planning and Application AD  
Southern Experiment Station  
U.S. Forest Service  
Room T-10210  
U.S. Postal Service Bldg.  
701 Loyola Avenue  
New Orleans, La. 70113  
Telephone: (504) 589-6712

U.S. ARMY TANK-AUTOMOTIVE RESEARCH & DEVELOPMENT COMMAND  
Warren, Michigan 48090

APPLICATION AREA

EXPERTISE

ELECTROTECHNOLOGY

General. . . . . Vehicle electrical systems.

ENERGY

Heating and Cooling  
Systems. . . . . For military vehicles.

Engine Studies  
(Energy Related) . . . . . Monitoring of vehicle performance  
characteristics.

ENVIRONMENTAL POLLUTION AND  
CONTROL

Air Pollution  
and Control. . . . . Emission controls for vehicles.

Noise Pollution  
and Control. . . . . For Army tactical and logistic  
vehicles.

INDUSTRIAL AND INFORMATION  
SCIENCES

Environmental  
Engineering. . . . . High temperature (hot/cold) charac-  
teristics of vehicles.

CONTACT:  
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U.S. Army Tank-Automotive Research  
and Development Command  
ATTN: DRDTA-RGR  
Warren, Michigan 48090  
Telephone: (313) 573-2319

TRANSPORTATION SYSTEMS CENTER  
Cambridge, Massachusetts 02142

APPLICATION AREA

EXPERTISE

COMMUNICATION

General. . . . . Development in the areas of command and control technology for advanced transportation systems.

ENERGY

Energy Use, Supply and Demand. . Develops alternatives for transportation energy conservation.

ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control. . . . . Developed data base management system for transportation air pollution studies; designed computer models of nationwide transportation-generated air pollution; performed air pollution dispersion tests.

Noise Pollution and Control. . . . . Developed and applied noise measurement analysis techniques to construction equipment, diesel-electric locomotives, lightweight rail cars, highway vehicles, mass transit wheel/rail equipment.

PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENT

Transportation . . . . . Research, development and analysis of new transportation systems.

Energy . . . . . Development of techniques to reduce fuel consumption.

TRANSPORTATION

Air Transportation . . . . . Plans, evaluates and develops future systems for air transportation.

Metropolitan Rail

Transportation . . . . . System management and technical capability for evaluating and improving the safety and productivity of the nation's ground transportation.

## APPLICATION AREA

## EXPERTISE

Transportation Safety. . . . .	Performs research, development and assessment of the safety for all forms of transportation.
Pipeline Transportation. . . . .	Assessment of nations's capacity for transporting oil, coal and natural gas.
Global Navigation Systems. . . . .	Aeronautical and marine satellite applications to improve traffic control.
Marine and Waterway Transportation . . . . .	Exploration of advanced technologies as they apply to marine systems.
Road Transportation. . . . .	Supports the Federal Highway Administration and Urban Mass Transportation Administration in improving and expanding existing systems and assessment of innovative transportation systems.
Railroad Transportation. . . . .	Supports the Federal Railway Administration in research and development of systems.
General. . . . .	All modes of transportation are included in the research, development, and improvement activities.

## URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT

Transportation and Traffic Planning . . . . .	Provides support for the nation's ground transportation and the Urban Mass Transportation Administration.
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### CONTACT:

Mr. R. V. Giangrande  
Transportation Systems Center  
Department of Transportation  
Mail Code 15  
Kendall Square  
Cambridge, Massachusetts 02142  
Telephone: (617) 494-2486

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U.S. GEOLOGICAL SURVEY  
Menlo Park, California

<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
<u>ASTRONOMY AND ASTROPHYSICS</u>	
Astrogeology . . . . .	Analysis of the composition and history of the planets.
<u>ATMOSPHERIC SCIENCES</u>	
Monitoring . . . . .	Applications of remote sensing.
<u>DETECTION AND COUNTERMEASURES</u>	
Seismic Detection. . . . .	Determining how to predict the time and intensity of earthquakes and control them through the gradual release of strain.
<u>ENERGY</u>	
General. . . . .	Supervision of energy industry operations to ensure safe and efficient operation, protection of the environment, maximum efficient recovery of the product.
Geothermal Energy. . . . .	Classification and evaluation of geothermal lands.
<u>NATURAL RESOURCES AND EARTH SCIENCES</u>	
Cartography. . . . .	Provides maps showing the configuration of the land surface, location of man-made features and present land use.
Geology and Geophysics . . . . .	Earthquake studies, environmental geology, energy resources, mineral resources, geochemistry and geophysics.
Hydrology and Limnology. . . . .	Hydrologic studies and areal appraisals of water resources are directed toward solutions to such problems as ground water contami-

APPLICATION AREA

EXPERTISE

nation, and understanding the physical and hydrologic framework of an entire watershed.

Mineral Industries . . . . . Provides information on rock composition and structure for prospecting of minerals.

Natural Resource  
Surveys. . . . . Appraisal of the lands' potential energy and mineral resources.

OCEAN TECHNOLOGY AND ENGINEERING

Marine Geophysics  
and Geology. . . . . Studies of the Continental Shelf and the ocean floor to provide information on the mineral and energy resource potential and environmental characteristics of the submerged lands.

CONTACT:

Mr. George E. Robinson  
U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, CA 94025  
Telephone: (415) 323-8111, ext. 2711

WALLOPS FLIGHT CENTER  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
Wallops Island, Virginia 23337

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Research Program Administration  
and Technology Transfer . . . . Research and development planning,  
contract management, technology  
transfer program.

AERONAUTICS AND AERODYNAMICS

Aircraft. . . . . Surveillance, mapping, satellite  
underflight, sensor research.

Airports. . . . . Airport-aircraft interface, air  
traffic control, avionics systems  
technology, noise reduction tech-  
nology, airport environmental  
studies, high speed turn-off tech-  
niques, approach and landing systems,  
and airport configuration.

General . . . . . Aircraft spin, cross-wind landings,  
pilot performance, procedures and  
aides at uncontrolled airport and  
safety.

ATMOSPHERIC SCIENCE

Meteorological Data Collection,  
Analysis and Weather  
Forecasting . . . . . Atmospheric dynamics, densities and  
winds as measured from satellites,  
rockets and balloons. Ozone measure-  
ments a specialty.

ELECTROTECHNOLOGY

Antennas. . . . . Design, applications and operations.

Electromechanical Devices . . . . Payload instruments.

Telemetry . . . . . Design, applications and operations.  
Instrumented vans.

APPLICATION AREA

EXPERTISE

OCEAN TECHNOLOGY AND ENGINEERING

Dynamic Oceanography . . . . . Study of waves, currents, tides and  
air-sea interaction.

ORDNANCE

Rockets. . . . . Building up rockets, handling and  
launching.

CONTACT: Gilmore H. Trafford  
Technology Utilization Officer  
Wallops Flight Center  
Wallops Island, Virginia 23337  
Telephone: (804) 824-3411, ext. 201  
FTS: 928-5201

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U. S. ARMY ENGINEER WATERWAYS EXPERIMENT STATION  
Vicksburg, Mississippi 39180

APPLICATION AREA

EXPERTISE

ADMINISTRATION

Computer Application . . . . . Hardware and software development;  
data communications network (WESNET);  
systems support; interactive graphics;  
applications and analysis; coding;  
ADP training; systems evaluation.

Management Information . . . . . Management Information System (MIS).

Research Program Administration  
and Technology Transfer. . . . . Conceives, plans, and executes re-  
search and development studies in  
support of civil and military missions  
of the Chief of Engineers; publishes  
results of research studies; maintains  
formal exchange agreements with foreign  
and domestic agencies; operates DoD  
Information Analysis Centers for  
Pavements and Soils Trafficability,  
Concrete Technology, Hydraulic Engi-  
neering, and Soil Mechanics; maintains  
extensive scientific and engineering  
reference library and Engineering  
Computer Programs Library.

AERONAUTICS AND AERODYNAMICS

Airports . . . . . Diversified and accelerated pavements  
research; design and evaluation of  
pavements; research on flexible, rigid,  
reinforced, fibrous, and prestressed  
concrete pavements systems; flexible  
overlays, joints, and joint sealers;  
design of paving mixes; total thickness  
design; compaction requirements and  
related aspects; theoretical pavement  
studies; investigations of expedient  
surfacing materials for military air-  
fields; rapid repair.

## APPLICATION AREA

## EXPERTISE

### Test Facilities and

Equipment. . . . . Well equipped testing laboratory; WES-developed gyratory compactor; special field facilities; construction equipment; special load carts with specific landing gear configurations; WES model testing apparatus for scale-model pavement tests; instrumentation monitoring devices; nondestructive test procedures; construction materials; concrete materials; repair materials.

General. . . . . Pavement design, construction, and evaluation; research in areas of new techniques in airfield construction; expedient surfacing materials/systems investigations; structural surfaces research; membrane systems research; surface preparation research; dust-control research; review of Army Facilities Component System; stability analyses of concrete structures.

## ATMOSPHERIC SCIENCES

### Meteorological Data Collection, Analysis, and Weather

Forecasting. . . . . Collection and analysis of hydrologic and climatological data as related to specific projects; local weather station; marine data hind-casting; lake data hind-casting; estimation of extremes.

## BUILDING INDUSTRY TECHNOLOGY

### Architectural Design and

Environmental Engineering. . . Engineering and construction services for design, construction, operation, and maintenance of facilities and equipment necessary to accomplish WES mission; surface finish; resistance to weathering.

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## APPLICATION AREA

## EXPERTISE

- Building Standards and Codes . . . Engineering design, technical specifications, engineering drawings, budget estimates, and construction inspection; plant replacement and improvement programs (internal); standards in all fields of concrete construction, plain, reinforced, pre-stressed; standards for acceptance of construction materials.
- Construction Management and Techniques . . . . . Management of all construction projects at WES relative to project studies; recommended practices for concrete construction.
- Structural Analyses. . . . . Physical and mathematical model studies to verify, refine, and/or develop the plan, design, operation, and maintenance of all types of hydraulic structures; stability analyses of concrete structures; analyses of concrete dams; analyses of soil/structure interaction; structural design of plain and reinforced concrete structures.
- General. . . . . All in-house construction as required to accomplish WES missions.

## CHEMISTRY

- Analytical Chemistry . . . . . Chemical analysis of concrete and concrete materials in fully equipped chemical analysis laboratory; methods of analysis of inorganic nonmetallic materials, especially cement, rock, soil, and clay; environmental engineering; contaminants parts-per-billion range; microbiological, chemical, and radioisotope tracer studies; climatic-controlled greenhouses; environmental chambers.
- Industrial Chemistry and Chemical Process Engineering. . . . . Chemical processes in cement hydration and alteration.

## APPLICATION AREA

## EXPERTISE

### Physical and Theoretical

Chemistry. . . . . Physical chemistry of inorganic non-metallic colloidal systems such as clay and portland cement.

Polymer Chemistry. . . . . Polymers in concrete impregnation and as protective coatings for concrete.

## CIVIL ENGINEERING

Civil Engineering. . . . . Soil mechanics; rock mechanics; pavements; engineering geology; earthquake engineering; soil and terrain mobility and trafficability; terrain analysis; remote sensing; hydraulics; structures.

Construction Equipment,  
Materials, and  
Supplies . . . . .

Testing construction equipment for offroad mobility; equipment and materials for pavements and expedient surfacing; landing mats; membranes; earthwork; compaction; cement; aggregate; soils; sand; gravel; crushed stone; pozzolan; reinforcing steel; bituminous concrete; precast concrete; rock; grout; mortar; organic additives; polymeric materials.

Earthquake Design. . . . . Dynamic properties of soils; stability calculations; embankment design; liquefaction; dynamic properties of mass concrete.

Flood Control. . . . . Use of physical and mathematical models for research; dams and channels; study of hurricane surges and tsunamis.

Highway Engineering. . . . . Compaction control; pavement design; membrane encapsulation and membrane underlay; durability and performance of material used in rigid pavements; vehicle mobility.



## APPLICATION AREA

## EXPERTISE

- Hydraulic engineering. . . . . Use of physical and mathematical models; design criteria; rivers; harbors; dams; locks; estuaries; wave action; riverine morphology; circulation; tides; sedimentation; hydraulic structures; field testing.
- Soil and Rock Mechanics. . . . . Embankment and foundation design; stability; seepage; excavation; characterization of clays; mechanical properties of rocks.

## COMMUNICATION

- Graphics . . . . . Interactive graphics; data such as design parameters, feature descriptions, stresses, etc. may be entered in the Tektronix 4012 and 4014 graphic display terminals resulting in a three-dimensional image of the structure under evaluation; other graphics hardware: hard-copy unit, audio recorder, interactive graphics tablet; skilled staff of engineers, mathematicians, physicists, and programmers to assist in computer applications; engineering graphics and illustrating: structural and mechanical drawing, topographical, geological, and environmental maps, and aerial mosaics; printing of technical reports and documents, charts and multicolored maps.

## COMPUTERS, CONTROL AND INFORMATION THEORY

- Computer Hardware. . . . . One Texas Instruments ASC computer system; one G-635 computer system; one G-437 computer system; graphics terminals; inquiry retrieval terminals; remote batch terminals; plotters (off-line).
- Computer Software. . . . . Programming; process control; data analysis; mathematical modeling.

## APPLICATION AREA

## EXPERTISE

### Information Processing

Standards. . . . . WES Automatic Data Processing (ADP) Center Programmer's Handbook (loose-leaf) furnished to assist ADP Center's customers in using the system to best satisfy their requirements; ADP Center sponsored training courses (for Federal employees only) such as "ADP Center Management in the Corps of Engineers," "GE-200 and GE-400 Systems and Operations," "FORTRAN Programming," "Computer Graphics," etc.; technical manual library.

### Pattern Recognition and Image

Processing . . . . . Aquatic plant management; terrain analysis; camouflage; remote sensing techniques.

## DETECTION AND COUNTERMEASURES

Acoustic Detection . . . . . Personnel and vehicle detection and classification.

Electromagnetic and Acoustic Countermeasures. . . . . Personnel and vehicle detection systems.

Infrared and Ultraviolet Detection. . . . . Archaeological site detection; roof maintenance aids; camouflage.

Magnetic Detection . . . . . Personnel and vehicle detection.

Optical Detection. . . . . Camouflage; environmental constraints; terrain analysis.

Personnel Detection. . . . . Design of seismic, acoustic, and magnetic detection systems.

Seismic Detection. . . . . Design of personnel and vehicle detection systems.

General. . . . . Personnel and vehicle detection.

## APPLICATION AREA

## EXPERTISE

### ENERGY

- Environmental Studies . . . . . Response to environmental stress of construction materials.
- Selected Studies in Nuclear  
Technology . . . . . Prestressed concrete nuclear reactor containment vessels; stemming and confinement of subsurface nuclear events.

### ENGINEERING ASPECTS OF EQUIPMENT AND STRUCTURAL DESIGN FOR ENVIRONMENTAL PURPOSES

- Water-Resources Program . . . . . Water Resources Assessment Methodology (WRAM); Environmental Water Quality Operational Studies (EWQOS); remote sensing systems.
- Confinement and Dewatering  
Dredging Materials . . . . . Guidelines for constructing, planning, and managing confined dredged material containment areas.
- Chemical Fixation of Hazardous  
Wastes . . . . . Process development and laboratory and field evaluation.
- Wastewater Treatment Systems . . . Methodology for Areawide Planning Studies (MAPS); Computer-Assisted Procedures for Design and Evaluation of Wastewater Treatment Systems (CAPDET); design, construction, and operation of small-scale wastewater treatment facilities.

### ENVIRONMENTAL INVENTORIES AND ASSESSMENTS

- Engineering Modifications to  
Riverine Systems . . . . . Environmental impact.
- Dredging and Open-Water Disposal  
of Dredged Material . . . . . Development of new or improved disposal practices or alternatives; possible productive uses of dredged material.

## APPLICATION AREA

## EXPERTISE

### ENVIRONMENTAL POLLUTION AND CONTROL

- Solid Wastes Pollution and Control. . . . . Recycling of waste concrete; use as construction materials of solid wastes such as fly ash, slag, and mine tailings; process evaluation (e.g., chemical stabilization, encapsulation, quantification of abatement procedures); evaluation of potential reuse and decontamination.
- Water Pollution and Control. . . Reservoir water quality; selective withdrawal; flushings; dispersion; heat dispersion; circulation; math modeling; criteria development; definition and quantification of nonpoint sources and transport processes of contaminants; automated data-collection methods; guidelines for waste treatment facilities at reservoirs and roadside rest areas; design and operations of small-scale wastewater treatment systems; Computer-Assisted Procedures for Design and Evaluation of Wastewater Treatment Systems (CAPDET); and Methodology for Areawide Planning Studies (MAPS).
- Pesticides Pollution and Control. . . . . Math modeling; criteria development.
- Environmental Health and Safety . . . . . Studies of wastewater management and various sewerage treatment alternatives; design and operation guidelines for small waste treatment systems to bring roadside rest area facilities into compliance with PL 92-500 (Federal Water Pollution Control Act); studies of pollutant potential of raw and chemically fixed hazardous industrial wastes and flue gas desulfurization sludges as concerned with the effectiveness of commercially

## APPLICATION AREA

## EXPERTISE

Environmental Health and Safety (contd) . . . . .	available fixation processes; domestic waste disposal studies, both urban and regional; water-quality evaluation.
Environmental Impact Statement. . . . .	Impact assessment methodology: Water Resources Assessment Methodology (WRAM).
General. . . . .	Functional use of natural ecosystems and specific biological and chemical processes; water-quality and ecologi- cal modeling; operation and manage- ment alternatives.

## ENVIRONMENTAL RESOURCE MANAGEMENT

Marsh Creation for Wildlife Habitats . . . . .	Guidelines for use of dredged mate- rial in marsh habitat development.
Recreation Planning. . . . .	Evaluation of benefits.
Fisheries Development. . . . .	Impact of flood-control and power- production practices.
Water-Quality Evaluation . . . . .	Water Resources Assessment Method- ology (WRAM); Environmental Water Quality Operational Studies (EWQOS).
Water-Quality and Ecological Simulation Models. . . . .	Environmental engineering.
Water-Resources Analysis . . . . .	Water Resources Assessment Method- ology (WRAM).
Land Treatment of Wastewater . . . . .	Overland flow studies (laboratory and field prototype studies).

## INDUSTRIAL AND MECHANICAL ENGINEERING

Environmental Engineering. . . . .	Limnology; aquatic and estuarine ecology; agricultural and sanitary engineering; aquatic and marine
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## APPLICATION AREA

## EXPERTISE

Environmental Engineering  
(contd). . . . . biology; botany; zoology; soil micro-  
biology; environmental chemistry;  
forestry; fisheries; wildlife manage-  
ment; reservoir water quality; rec-  
reation; resource planning.

Hydraulic and Pneumatic  
Equipment. . . . . Sump pumps.

Nondestructive Testing . . . . . Nondestructive evaluation of concrete  
structures and elements of all sizes  
and shapes using optical, velocity,  
vibration, and impact techniques;  
physical model testing; prototype  
testing.

Plant Design and Maintenance . . . . . Design and maintenance of pumping  
plants; jet pumps.

## LIBRARY AND INFORMATION SCIENCE

Information Systems. . . . . Access to Department of Defense's  
automated RDT&E data base at Defense  
Documentation Center (JDC), Alex-  
andria, Virginia, and access to  
Lockheed's DIALOG System at Palo  
Alto, California; support for WES  
Soil Mechanics and Pavements and  
Soils Trafficability Technical In-  
formation Analysis Center in con-  
structing an automated data base in  
Geotechnical Engineering.

Marketing and User Services. . . . . Literature searches on DDC and  
Lockheed Systems for patrons of Tech-  
nical Information Center (TIC) at WES.

Operations and Planning. . . . . Use of WES ADP Center's GE computer  
for automated reports distribution  
lists, library circulation lists, and  
internal Management Information Sys-  
tem.

Personnel. . . . . Use of WES ADP Center's GE computer  
for automated personnel records,  
personnel training information, etc.

## APPLICATION AREA

## EXPERTISE

Reference Materials. . . . . Technical Library collection numbering over 200,000 items, including books, technical reports, periodicals, reprints, and 3 types of microform; catalogs on file for eleven other large libraries; access to DDC and Lockheed data bases.

Environmental Resource Data  
Analysis . . . . . Water Resources Assessment Methodology (WRAM); Computer-Assisted Procedures for Design and Evaluation of Wastewater Treatment Systems (CAPDET); Methodology for Areawide Planning Studies (MAPS).

General. . . . . Continuing use and evaluation of automated data bases; participant in Federal Library Network Prototype Project; investigation of ways and means of faster document delivery via telecommunication, specifically slow-scan television, telefacsimile, and satellite.

## MATERIALS SCIENCES

Ceramics, Refractories, and  
Glass. . . . . Physical, chemical, mechanical, and performance research on cements, concretes, glasses, and rocks.

Coatings, Colorants, and  
Finishes . . . . . Acid-resistant, abrasion-resistant, and architectural coatings for mortars and concretes.

Composite Materials. . . . . Performance and evaluation tests of pavements and expedient surfacing for roads and airfields; fiber-reinforced cement in concrete, concrete mortar, reinforced concrete, prestressed concrete.

Corrosion and Corrosion  
Inhibition . . . . . Sea water attack on concrete and reinforcing steel; prevention of corrosion of prestressing steel.

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<u>APPLICATION AREA</u>	<u>EXPERTISE</u>
Elastomers. . . . .	Performance and evaluation tests of pavements and expedient surfacing for roads and airfields; rubber and plastic waterstops for concrete structures.
Fibers and Textiles. . . . .	Performance and evaluation tests of pavements and expedient surfacing for roads and airfields; steel, glass, and organic fibers as used in fiber-reinforced concrete and cement.
Iron and Iron Alloys . . . . .	Performance and evaluation tests of pavements and expedient surfacings for roads and airfields.
Materials Degradation and Fouling. . . . .	Performance and evaluation tests of pavements and expedient surfacings for roads and airfields; resistance to degradation of inorganic nonmetallic materials, reinforcing and prestressing steel, and elastomers such as waterstops.
Miscellaneous Materials. . . . .	Performance and evaluation tests of pavements and expedient surfacings for roads and airfields.
Nondestructive Testing . . . . .	Performance and evaluation tests of pavements and expedient surfacings for roads and airfields; vibratory-seismic testing of pavements; nuclear moisture-density test; X-ray and nuclear interrogation of specimens; nondestructive evaluation of concrete structures and elements of all sizes and shapes using optical, velocity, vibration, and impact techniques.
Nonferrous Metals and Alloys . . . . .	Performance and evaluation tests of pavements and expedient surfacings for roads and airfields.
Plastics . . . . .	Performance and evaluation tests of pavements and expedient surfacings for roads and airfields; liquid film-forming



## APPLICATION AREA

## EXPERTISE

Plastics (contd) . . . . . resins for curing concrete; materials for polymer and bonding polymer impregnation; rubber and plastic waterstops for concrete structures.

General. . . . . Soil tests; concrete (all areas); bituminous concrete tests; landing mat tests.

## MATHEMATICAL SCIENCES

Operations Research. . . . . Analyst support.

## MEDICINE AND BIOLOGY

Botany . . . . . Environmental engineering.

Ecology. . . . . Environmental engineering.

Pest Control . . . . . Evaluation of chemical, biological, and engineering procedure for mosquito control in dredged material containment areas.

Zoology. . . . . Environmental engineering.

## NATURAL RESOURCES AND EARTH SCIENCES

Geology and Geophysics . . . . . Foundation investigations; seismic and resistivity surveys; Rayleigh wave propagation; application of mineralogy, crystallography, petrology, and petrography to aggregates, cements, and concrete.

Hydrology and Limnology. . . . . Groundwater regimes.

Snow, Ice, and Permafrost. . . . . Terrain trafficability; surface strength prediction techniques; resistance of construction materials to freezing and thawing; phenomenology of ice formation in water-saturated porous media.

## APPLICATION AREA

## EXPERTISE

- Soil Sciences. . . . . Soil moisture and strength prediction in trafficability studies; trafficability classification; pavement foundations; characterization of clay systems.
- General. . . . . Soil and terrain trafficability; pavements and expedient surfacings; terrain analysis.

## NAVIGATION, GUIDANCE AND CONTROL

- Navigation Systems . . . . . Structural design, condition evaluation, and construction materials for navigation locks and port facilities; model studies using self-propelled, radio-controlled model ships for testing the navigability of locks and approaches; use of models to determine composition and positioning of lock-and-dam components, dimensions and locations of approach wall and navigation passes, etc.

## NUCLEAR SCIENCE AND TECHNOLOGY

- Nuclear Explosions and  
Devices. . . . . Underground and underwater explosion phenomenology and effects; investigation of air blast, ground shock, cratering, and ejecta produced by subsurface explosions; effects of explosions on structures.
- Nuclear Instrumentation. . . . . Research aimed at upgrading existing sensors and electronic systems; development of sensors, systems and placement methodology; electronic recording equipment and high-speed motion picture photography used in data acquisitions.
- Radiation Shielding, Protection  
and Safety . . . . . Development of guides to assist in controlling explosive effects during civil-type evacuation programs; design of protective structures; minimization

## APPLICATION AREA

## EXPERTISE

Radiation Shielding, Protection and Safety (contd) . . . . .	of safety hazards involved with under- ground storage of explosives; high- density aggregates in concrete.
Radioactive Wastes and Radioactivity. . . . .	Concrete production for encapsulation and stemming in connection with under- ground disposal.

## OCEAN TECHNOLOGY AND ENGINEERING

Dynamic Oceanography . . . . .	Study of wave dynamics, particularly by means of models; air/sea inter- action; hurricane surges; tsunamis; wind-driven circulation; model studies for prevention of shoaling in offshore and entrance tidal channels; study of waste dispersion patterns and flushing rates.
Effects of Ocean-Dumping of Dredged Material . . . . .	Evaluation; impact assessment; cri- teria development.
Hydrography. . . . .	Hydrographic surveying systems.
Marine Engineering . . . . .	Resistance of construction materials to weathering and corrosion in sea water; navigation facilities; shore and channel protection; harbor de- sign; inlet morphology and processes.
Marine Geophysics and Geology. . . . .	Bottom morphology and sediments; sub- bottom structure; location of mate- rials for beach fill; use of EG&G Uniboom System, ORE Pinger System, ORE Side-Scan Sonar System; staff geologists, geophysicists, and soil engineers for consultation, presurvey assessments, and office interpretation of records.

## APPLICATION AREA

## EXPERTISE

### Physical and Chemical

Oceanography . . . . . Capable of evaluation of ecological effects and regulatory criteria of sediment and water chemistry; bio-assay facilities for evaluation of lethal and sublethal effects of suspended solids and chemical contaminants on organisms; studies of openwater disposal of dredged material in respect to turbidity, water quality, aquatic ecology; instrumentation capable of rapid response to change of velocity, water temperature, dissolved oxygen, pH, turbidity, and conductivity.

### Underwater Construction and

Habitats . . . . . Selection of construction materials for marine constructions; structural design.

## ORDNANCE

Armor. . . . . Test of weapons effects on various types of material to determine the effectiveness of the material for armor.

Bombs. . . . . Studies of the effects of various types and sizes of conventional explosives on structures and terrain features; development of a bulk-loading explosive system for military field use; use of blast load generator for simulating the pressure-time histories of blast loadings from kiloton and megaton weapons; TNT casting facility available for melting and casting explosive charges in various shapes and sizes up to 300 pounds in weight.

Combat Vehicles. . . . . Vehicle mobility tests and mobility prediction.

Detonations, Explosion Effects,  
and Ballistics . . . . . All aspects.

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## APPLICATION AREA

## EXPERTISE

### PHOTOGRAPHY AND RECORDING DEVICES

Photographic Techniques and  
Equipment. . . . .

Borehole optical tools including still photography, television, and periscopic examination; two borehole cameras (one for NX holes and one for large diameter holes); special projector; complete taping capability for television observation of openings of unlimited diameter; personnel qualified to interpret and log borehole photography are available on request.

Recording Devices. . . . .

For terrain analysis, soil moisture, and strength for trafficability; pavement design and tests; pavement performance and evaluation; meteorological events.

### PHYSICS

Acoustics. . . . .

Sub-bottom acoustic profile surveys to identify sources of material for beach replenishment; use of acoustic sub-bottom profilers and side-scan sonar; measurements of the acoustic environments associated with blasting, rocket launches, and various transportation vehicles; acoustic flowmeter prototype evaluation tests; acoustical geophysical surveys of cavernous areas; acoustic wave propagation analytical models for examining existing and proposed acoustic sensor systems for their performance against a variety of targets and a variety of terrain conditions.

Fluid Mechanics. . . . .

Open channels; closed conduits; wave mechanics; air/sea interaction.

Optics and Lasers. . . . .

Airborne laser profilometers and laser surveying devices for environmental evaluation of water quality, terrain analysis, land management problems, and hydrologic and hydrographic analyses,

## APPLICATION AREA

## EXPERTISE

Optics and Lasers (contd). . . . and evaluation of unprepared landing sites; studies of effects of aquatic weeds to laser radiation; optical density characteristics of irradiated vegetation and suspended riverine material; use of nomogram for computing optical density contrasts for environmental management purposes; determination of light reflectance of concrete structures.

Structural Mechanics . . . . . All aspects.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Energy . . . . . Design and construction of energy-related facilities.

Environment. . . . . Terrain analysis; impact statements; reservoir water quality.

## TRANSPORTATION

Air Transportation . . . . . Rapid repair of airfields.

### Marine and Waterway

Transportation . . . . . Structural design, condition evaluation, and construction materials for navigation locks and port facilities; navigation channels and channel regulation structures; traffic simulation; bankline protection.

### Offroad Mobility or

Transportation . . . . . Test and evaluation of vehicle mobility.

Railroad Transportation. . . . . Evaluation of concrete structures, bridges, and crossties.

Road Transportation. . . . . Vehicle mobility; pavements; structural design; material selection; performance evaluation; concrete in pavements; bridges.

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## APPLICATION AREA

## EXPERTISE

### PHOTOGRAPHY AND RECORDING DEVICES

Photographic Techniques and  
Equipment. . . . .

Borehole optical tools including still photography, television, and periscopic examination; two borehole cameras (one for NX holes and one for large diameter holes); special projector; complete taping capability for television observation of openings of unlimited diameter; personnel qualified to interpret and log borehole photography are available on request.

Recording Devices. . . . .

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Acoustics. . . . .

Sub-bottom acoustic profile surveys to identify sources of material for beach replenishment; use of acoustic sub-bottom profilers and side-scan sonar; measurements of the acoustic environments associated with blasting, rocket launches, and various transportation vehicles; acoustic flowmeter prototype evaluation tests; acoustical geophysical surveys of cavernous areas; acoustic wave propagation analytical models for examining existing and proposed acoustic sensor systems for their performance against a variety of targets and a variety of terrain conditions.

Fluid Mechanics. . . . .

Open channels; closed conduits; wave mechanics; air/sea interaction.

Optics and Lasers. . . . .

Airborne laser profilometers and laser surveying devices for environmental evaluation of water quality, terrain analysis, land management problems, and hydrologic and hydrographic analyses,

## APPLICATION AREA

## EXPERTISE

Optics and Lasers (contd). . . . . and evaluation of unprepared landing sites; studies of effects of aquatic weeds to laser radiation; optical density characteristics of irradiated vegetation and suspended riverine material; use of nomogram for computing optical density contrasts for environmental management purposes; determination of light reflectance of concrete structures.

Structural Mechanics . . . . . All aspects.

## PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS

Energy . . . . . Design and construction of energy-related facilities.

Environment. . . . . Terrain analysis; impact statements; reservoir water quality.

## TRANSPORTATION

Air Transportation . . . . . Rapid repair of airfields.

### Marine and Waterway

Transportation . . . . . Structural design, condition evaluation, and construction materials for navigation locks and port facilities; navigation channels and channel regulation structures; traffic simulation; bankline protection.

### Offroad Mobility or

Transportation . . . . . Test and evaluation of vehicle mobility.

Railroad Transportation. . . . . Evaluation of concrete structures, bridges, and crossties.

Road Transportation. . . . . Vehicle mobility; pavements; structural design; material selection; performance evaluation; concrete in pavements; bridges.



## **TECHNOLOGY TRANSFER EXAMPLES**

### **ADMINISTRATION**

#### **Inventory Control**

The Construction Engineering Research Laboratory has developed an inventory control system for operation of commissaries in the U.S. Army.

#### **Management Practice**

Construction Engineering Research Laboratory has developed zero-budgeting for operation and maintenance activities for operating and maintaining navigable rivers in the United States.

#### **Research Program Administration and Technology Transfer**

Los Alamos Scientific Laboratory has pioneered the development of Industrial Staff Member programs, permitting industrial scientists and engineers to work at LASL for extended periods of time, for direct person-to-person technology transfer.

#### **Personnel Management, Labor Relations, and Manpower Studies**

The Armed Services Vocational Aptitude Battery (ASVAB) has been used in high schools for civilian occupational counseling as well as armed services recruiting.

### **AERONAUTICS AND AERODYNAMICS**

NADC has assisted the U.S. Customs Service in the definition, design and development of a prototype aircraft system to counter air smuggling across U.S. borders.

NADC is assisting the U.S. Coast Guard in performing system definition and integration of an airborne multisensor system including electro-optics radar photo, to be used for multi-purpose missions including search and rescue, environmental protection, enforcement of laws and treaties.

### **AGRICULTURE AND FOOD**

#### **Agricultural Equipment, Facilities, and Operations**

Los Alamos Scientific Laboratory is developing for the USDA an implantable transponder used for animal identification and temperature monitoring. A company has been organized to commercialize this technology.

## Animal Husbandry and Veterinary Medicine

The USDA is supporting a program at the Los Alamos Scientific Laboratory to develop rapid disease diagnosis techniques for animals and meat. LASL developed techniques for local application of heat for tumor therapy. This technique has been successfully applied to treatment of domestic, farm and zoo animals.

## Fisheries and Aquaculture

Naval Ocean Systems Center conducted experiments on the farming of seaweed which could be harvested, dried and burned as a fuel source.

## Food Technology

Army Natick Research and Development Command prepared a proposal and provided consultation to the San Diego School System on their school lunch program. Consumer evaluation and preferences for food items and menus have been developed and applied extensively to military feeding systems. These techniques have been provided to the San Diego School System for evaluation of student food preferences and frequencies in order to increase student participation and decrease food wastes.

## ATMOSPHERIC SCIENCES

### Meteorological Instruments and Instrument Platforms

The Department of Transportation sponsored data acquisition operations at the Los Alamos Scientific Laboratory for climate impact assessment.

### Weather Modification

The Naval Weapons Center has developed a small diameter pyrotechnic catalyst generator and an airborne dispenser to be used for the National Oceanic and Atmospheric Administrations' Project Stormfury.

Pyrotechnic generators and cloud-seeding methods originated at NWC are employed in rain-making to relieve droughts throughout the world.

## BEHAVIOR AND SOCIETY

### General

The Construction Engineering Research Laboratory has developed a procedure for having the physical space serve as a facilitator to the occupants in the use of the space in performing his functions. This procedure has been used for a large-scale office complex for FAA, the office of the Civil Works Directorate of the U.S. Army Corps of Engineers, in dining facilities for all three services, and for research stations in research laboratories for both the Navy and the Army.

## **Job Training and Career Opportunities**

Functional job-reading training courses have been developed for a number of Military Occupational Specialties (MOS), to enable marginally literate trainees acquire job-related reading skills.

## **Organizational Psychology**

The RIBSS has provided technical advisory service to various Army commands and agencies on utilization and evaluation of Organizational Effectiveness strategies, and has developed leadership/management workshops for application in Army units.

## **Social Concerns**

RIBSS-developed research instruments have included an index for measuring over/under representation of women and minority groups in the Army, a sex-role attitude scale, and a Racial Awareness and Perceptions Survey.

## **Education, Law, and Humanities**

RIBSS has developed training programs for training managers and trainers in the employment of performance-based techniques to train and evaluate individual performance in the unit. Related ARI-developed literature includes a criterion-referenced test construction manual, a guidebook for the development of Army training literature, and a manual on how to apply systems engineering methods to unit training and evaluation.

## **BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS ENGINEERING**

### **Biomedical Instrumentation and Bioengineering**

The Naval Ocean Systems Center has developed a new head controller for wheelchair users which provides variable speed and turning rates for the chair. They also built a scale for weighing burn patients in bed, a blood pressure monitor for real-time blood pressure readings, a wheelchair which allows paralyzed persons to stand.

Naval Air Development Center has loaned specialized equipment for cancer research projects at the Institute of Cancer Research; provided information and resource assistance on the health hazard and possible solution to the problems of waste anesthetic gases to a group of area hospitals; determined the physiological effects on man breathing 100 percent oxygen for extended periods; measured the effects of linear and angular acceleration on human performance for NASA.

NADC has designed and tested a new vehicle occupant restraint system which inflates upon impact and includes lap and shoulder harnesses which resemble conventional restraint systems in their uninflated state. Upon impact an inflatable bladder attached underneath a restraint strap inflates and acts to cushion the pelvis and chest areas against the forces of collision. The system has been successfully demonstrated at NASA's Langley Research Center. NADC designed, tested and delivered cold water survival equipment to the U.S. Coast Guard as part of the ship Escape Survival and

Rescue Detection system for Great Lakes Water shipboard operations. NADC conducted the research that eventually led to the development of thermal protective clothing using NOMEX fibers. This technology was soon adopted by the textile industry for the manufacture of underclothing, flight suits, overalls, fireman's turnout coats, hospital linen and racing driving suits. NADC has an on-going program of fundamental and applied biomedical research which has led to new components and methodology for the detection and reversal of the degenerative and terminal effects of ischemic anoxic stress.

The Chemical Systems Laboratory has developed the mouth-to-mouth resuscitation method used throughout the world.

Chemical Systems Laboratory has developed nerve gas derivatives that are being used to treat glaucoma.

Lewis Research Center applied expertise in satellite and spacecraft communications to the preparation of specifications and the selection of equipment for a vital signs RF telemetry system linking Fairview General Hospital in Cleveland, Ohio, with nearby suburban fire department rescue squads.

NASA's John F. Kennedy Space Center engineers have developed a method which may enable doctors to detect early stages of breast cancer and to determine the likelihood that a woman will ever develop breast cancer.

This experimental technique for early cancer detection is a product of X-ray enhancement -- the ability of computers to enhance or make more visible information from X-rays not ordinarily detectable by the human eye.

### Human Factors Engineering

The Naval Ocean Systems Center conducted an anthropometric study of 3,000 police officers in the U.S. for National Bureau of Standards. This will give equipment designers more current data on size and dimensions of law enforcement personnel in the U.S.

A technique developed by NOSC for using a computer to measure brain wave patterns developed by seeing a target is now used to test visual and auditory defects in children at a local San Diego hospital.

### Life Support Systems

Los Alamos Scientific Laboratory conducts training sessions on the proper choice and use of respirators; these are held throughout the country for industry and government.

## **BUILDING INDUSTRY TECHNOLOGY**

### Architectural Design and Environmental Engineering

In architectural design, Construction Engineering Research Laboratory has developed techniques to determine user needs and preferences in maintaining sociological, psychological, and physiological considerations.

## Construction Management and Techniques

In construction management and techniques, Construction Engineering Research Laboratory has developed a computer-based network planning tool for use by the U.S. Army Corps of Engineers and a manual on Impact of Change-Orders for use by negotiators in assessing costs resulting from changes in project scope or construction conditions after award of the contract. Numerous examples of the evaluation of construction materials, components and equipment have been provided to Army and Air Force installations for floors, furnishings, roofing systems, plastics, etc.

## Building Standards and Codes

David Taylor Naval Ships Research and Development Center determined the fire resistance of selected merchant marine cables to improve fire standards.

## **CHEMISTRY**

### Analytical Chemistry

Lewis Research Center, working with Stanford Research Institute and Chicago State University, has adopted an ultrasonic cavitation metallographic analysis technique to the restoration of serial numbers illegally ground off metal objects such as guns and engines. The process has been disseminated for use by law enforcement agencies.

## **CIVIL ENGINEERING**

### Civil Engineering

The Construction Engineering Research Laboratory has developed the specifications for fibrous reinforced concrete for use in pavement slabs and in beams in building construction. This material in some applications has life-cycle cost improvements in an order magnitude of 10:1 over the competitive portland cement concrete.

## **COMMUNICATION**

### Radio and Television Equipment

Naval Ocean Systems Center personnel assisted the Palo Indian Tribe in designing a cable TV system for use on the Palo Reservation. Equipment was purchased and installed by the Indians.

The Forest Fire Laboratory has evaluated and demonstrated land mobile, frequency-synthesized transceivers, and developed telemetry and television air-to-ground transmission systems.

The Boise Interagency Fire Center has field radio caches which can be made available within hours to any location in the country. Also developed are telemetry and infrared image transmission systems.

The Institute for Telecommunication Sciences has designed a communication system for the U.S. Forest Service that will provide command/control and data relay for up to five simultaneous forest fire incidents. The system will interface Forest Service communication with the State of California and local government groups involved in fire fighting activities.

## Communication and Information Theory

RIBSS scientists have developed specialized computer software and interfaces between computers and graphics terminals to study information flow and man-machine interaction in battlefield information systems; for example, the use of graphics to encode tactical data for purposes of command and control.

## **COMPUTERS, CONTROL AND INFORMATION THEORY**

### Computer Software

In computer software, Construction Engineering Research Laboratory has developed a computer-aided hospital equipment maintenance system which is in use at the Eisenhower Hospital at Fort Gordon, Georgia. This system is expected to convert operation and maintenance personnel from a 90 percent catastrophic maintenance posture to an 80 percent preventive maintenance posture.

The Naval Underwater Systems Center's PERT TIME/COST system is one of the most powerful Program Evaluation and Review Technique Systems in existence. Its multiproject scheduling and resource-tracking algorithm and cost-schedule-planning and control device can accommodate several projects simultaneously. The system has been used extensively for the management of Navy projects and has been transferred to non-DoD agencies and to some U.S. industrial firms.

### General

Los Alamos Scientific Laboratory developed a data base management system for the Museum of New Mexico.

BNL has conducted research related to the utilization of large computers, computer graphics, statistics, scientific applications of computers, data base management and digital design automation.

## **DETECTION AND COUNTERMEASURES**

### Infrared and Ultraviolet Detection

The Boise Interagency Fire Center has available for use airborne infrared detection and mapping system with imagery reproduction, recording and transmitting capabilities.

### Optical Detection

The Naval Weapons Center developed a device to measure the height of trees and stem diameters.

### Personnel Detection

Mobility Equipment Research and Development Command's extensive multi-disciplinary research concerned with the detection of land mines and tunnels has produced a variety of useful spinoffs. Examples are a highly specific mail-bomb detector; advanced electromagnetic techniques for the detection of plastic pipe which is now widely used for gas, water, and sewer distribution systems; and the exploitation of canines for specific law enforcement tasks. Canine selection, training, and

handling manuals are currently being prepared and will be available for use by civilian agencies. Consultant services on state-of-the-art detection technology are being provided to the Department of State, the U.S. Postal Service, and Police Departments of numerous communities across the United States.

The Naval Ocean Systems Center designed a doppler radar for base perimeter security which can pick up walking people or slow moving vehicles. This device is ideal for use by law enforcement agencies who want to know if a given area has been penetrated.

## **ELLECTROTECHNOLOGY**

### **Optoelectronic Devices and Systems**

Sandia Laboratories has patented and released several generations of electro-optic devices using quadratic PLZT ceramic elements for information storage and display techniques. These may be obtained through non-exclusive license through ERDA.

### **Power and Signal Transmission Devices**

Civil Engineering Laboratory has developed a device to detect and monitor fluctuations in the power supply to sensitive apparatus such as communications equipment and computers. This device is now being manufactured and sold commercially. A follow-up device that promises to be of equal or even greater value is an electrical transient direction detector which can identify whether the disturbance is caused by the power source or the load.

## **ENERGY**

### **Batteries and Components**

Lewis Research Center developed and demonstrated highly rechargeable nickel-zinc batteries whose relative energy density doubles the operating range of U.S. Postal System electric mail delivery vehicles and other electric automobiles.

### **Energy Use, Supply and Demand**

BNL has conducted technological, economic, and biomedical assessments of regional, national, and international energy systems; energy policy analysis; and energy problems of developing nations. They have established a major data base, energy network simulator, and optimization models for U.S. energy system.

Forest Service Research has developed techniques to help forest industries become energy self sufficient.

Working with the Philadelphia Mayor's Science and Technology Advisory Council, the Technology Transfer Office at NADC, Warminster, PA, initiated and coordinated an infrared flyover of portions of Philadelphia and Warminster to detect heat loss from buildings and houses.

## Electric Power Transmission

Especially noteworthy are the Mobility Equipment Research and Development Command's efforts to help alleviate the energy crisis. The introduction of methanol fuel and the development of novel energy conversion devices based on fuel cell photovoltaic technology are of substantial value to the civilian community. Other spinoffs involve electric vehicle propulsion technology, improved electric conductors made from noncritical materials, and improved efficiency of electric power sources through the use of ceramic components and advanced, solid-state electronics.

Los Alamos Scientific Laboratory is discussing with Consolidated Edison and EPRI the possibility of installing a superconducting dc transmission line on Long Island in the early 1980's.

## Fuels

The Naval Weapons Center has successfully developed for the EPA a method for converting municipal solid waste to polymer gasoline.

NOSC has been working on techniques to conduct aerial surveys of uranium deposits.

## Solar Energy

Construction Engineering Research Laboratory has developed universal curves which quickly provide a design on the economic life-cycle cost of solar energy heating and cooling as a supplemental or total energy source in all regions of the country. In energy use supply and demand CERE has developed a system for metering all users in typical Army facilities and reducing this data to supply and demand curves. CERL has also developed an innovative program for matching performance of facilities as an energy consuming unit with capacity and economics of alternate sources of energy supply and of distribution and control systems in both retrofitting old facilities and constructing new facilities. CERL has also developed economic evaluation of refuse derived fuel as a supplementary fuel for use in military installations.

A mechanical device engineer at the Naval Underwater Systems Center has been assigned (via the Intergovernmental Personnel Act of 1970) to the State of Connecticut Department of Planning and Energy Policy as a technology agent. The agent will assist in the fields of solar energy and energy conservation and will help to design and implement training programs in solar energy.

Los Alamos Scientific Laboratory has developed, for the Pacific Region, a handbook for architects, builders and consumers on optimal solar heating system design.

ERDA is supporting the testing of large heliostats at NWC for use in a solar thermal conversion program.

Swimming pool heating by solar energy - NOSC worked with the City of San Diego on this successful project.

Lewis Research Center, for DOE, built and demonstrated solar cell power sources for weather stations, navigation buoys, refrigerators, ranger's lookout stations and other installations where conventional electric power sources are not readily accessible.



LeRC, for DOE, is designing and building large wind-driven electric power generating systems, ranging in size from 100 kW to 1500 kW, for joint operation with local electric utility companies.

### Miscellaneous Energy Conversion and Storage

Mobility Equipment Research and Development Command is providing technical support to the Mass Transportation Center of the Department of Transportation in the area of energy managing electromechanical transmission systems which efficiently transfer or recuperate energy between a flywheel and the vehicle wheels. The results of a study conducted by this Command are currently under active consideration for possible use in bus-type, mass-transit vehicles.

MERADCOM developed an Integrated Power Switch (IPS) which is an integrated power function that provides industry with a basic building block suitable for power conditioners in ratings to 30 kW. This building block is currently manufactured by Texas Instruments, Inc. in preproduction quantities. The IPS is utilized in evaluation quantities by several U.S. manufacturers in new equipment design and is considered for potential use in the space shuttle by NASA and Delco Electronics Co.

The Naval Weapons Center conducted a survey for ERDA to determine the usefulness of currently used heat exchangers. This agency is also supporting NWC to demonstrate the use of photovoltaics to power a remote radar site.

NOSC built a pilot marine farm and conducted experiments to determine the feasibility of converting insolation energy on an open ocean site into synthetic natural gas, foods, and other products. Analysis indicates favorable economic factors. Methane was produced by anaerobic digestion.

### Geothermal Energy

NWC has provided consulting services to local city officials on geothermal exploration. Slim-hole drilling at the Coso Geothermal Area sponsored by ERDA is underway. Geothermal corrosion studies have been undertaken as a continuing task as well as institutional studies conducted for the Navy.

### General

The heat pipe--a fast, passive heat transfer device--was invented at Los Alamos Scientific Laboratory and has found wide applications in such areas as heat recovery for energy conversion, temperature stabilization of industrial processes, and stabilization of the permafrost on the Alaska pipeline.

NOSC personnel are members of the Energy Advisory Board for the San Diego Unified School District and have chaired a panel at the Regional Energy Policy Symposium.

Lawrence Livermore Laboratory has been conducting studies for the State of California in assessing energy supply and demand projections for energy source development.

LLL has recently completed a compendium of background information on the energy situation in Hawaii. This profile is part of ongoing efforts to help the State assess its technological needs and to identify technologies developed here or at other national laboratories that are applicable to those needs.

LLL developed a microcomputer interface assembly to couple water flow sensors to central data logging systems for plant control at the Edward Hyatt Power Plant (California Oroville Dam). This was done in cooperation with the California Department of Water Resources. As a followup, LLL conducted a series of training courses in microcomputer system design so that, in the future, all microcomputer system design could be done by DWR project engineers themselves.

Brookhaven National Laboratory has projects in solar technology, technology transfer, hydrogen-hydride storage and utilization technology, fuel oil and natural gas combustion efficiency, energy conservation in buildings, energy chemistry and materials programs, superconductive power transmission, and nuclear reactor safety studies and nuclear materials safeguards.

## ENVIRONMENTAL POLLUTION AND CONTROL

### Air Pollution and Control

The Naval Weapons Center has provided the State of California with 3-dimensional sampling data of air pollutants in the Los Angeles Basin, San Joaquin Valley and other local areas through the use of an instrumented van and aircraft. High volume air samples for mass concentration are taken periodically for the local county health department.

Lawrence Livermore Laboratory has developed, in conjunction with the National Aeronautics and Space Administration Ames Research Center and the San Francisco Bay Area Air Pollution Control District (BAAPCD), a regional, photochemical air quality model suitable for use by the BAAPCD as an operational tool in its air quality control program for the San Francisco Bay area. The program was funded under the RANN program of the National Science Foundation. LLL provided the following: program definition and organization; overall program management; technical lead in model development, photochemical studies, data processing and banking; "user orientation" of the model; preparation of documentation and a user's guide. As a result, a state-of-the-art photochemical air quality model for the San Francisco region was developed and an initial library of input data files was prepared. The model and its library was transferred to the Lawrence Berkeley Laboratory computer for independent, remote use by the BAAPCD, and the software necessary for preparation of additional data files was made available to the BAAPCD.

LLL has developed instrumentation for detecting, monitoring and analyzing atmospheric pollutants subject to regulation by Federal and State agencies. For example, LLL provided assistance in planning, organizing, and executing technical programs for microwave and X-ray fluorescence spectrometers for users like the California Air Resources Board and the National Institute of Occupational Safety and Health to measure numerous noxious gases and vapors.

BNL has conducted oceanographic and meteorological studies of the North Atlantic coast. They have also studied atmospheric pollution and acid rainfall, nuclear waste disposal, hydrolysis of coal, and structural polymer materials.

David Taylor Naval Ships Research and Development Center provided NASA with test facilities, support personnel and instrumentation to estimate the airframe radiated noise of a Boeing 747 aircraft during landing.

Mobility Equipment Research and Development Command is providing technical support to the EPA's Office of Noise abatement and Control in meeting its statutory requirements under the Noise Control Act of 1972. This support includes the provision of test sites, measurement equipment, and technical personnel to gather and analyze noise data for various items of equipment subject to possible ONAC regulatory actions. In addition, consultation is provided in the development of new standards and test procedures.

Lewis Research Center developed and demonstrated advanced air quality monitoring devices and systems including an automated directionally-sensitive monitoring device, contaminant analysis, and data reduction methods for the City of Cleveland, Ohio, and the EPA.

### Solid Wastes Pollution and Control

Army Natick Research and Development Command conducted a symposium on 8-10 September 1975 on the "Enzymatic Conversion of Cellulosic Materials: Technology and Application." Purpose of the symposium was to communicate to industry and public agencies the current state of cellulose production and to suggest and evaluate potential applications - technology transfer. The symposium was attended by over 300 scientists, engineers, and public officials from U.S. and foreign countries.

Forest Service has developed a system by which cities can recycle their waste materials.

David Taylor Naval Ship Research and Development Command evaluated material performance in ship incinerator environments to improve the efficiency, reliability and performance of shipboard waste processing systems.

Sandia Laboratories has an ongoing project in which sewage sludge is exposed to thermo-radiation to kill the pathogens so that the sludge may be used on crop-producing land or in livestock refeeding programs. A wide range of potential uses is anticipated in which low temperature pasturization is possible due to the synergistic combination of small amounts of heat and low-dose radiation. Inquiries are invited.

As a result of a request made to our representative at a state technology transfer meeting, CEEDO provided the State of Oregon with information on the treatment of corn processing wastes, rural sanitation systems and tertiary treatment of domestic wastes.

### Water Pollution and Control

DTNSRDC has developed methods for enhancing existing shipboard sewage treatment systems effluent quality.

MERADCOM performed a water purification project for the city of Duluth, Minnesota to remove asbestos fibers from Lake Superior. The air-transportable unit used purifies 420 gallons per hour, 24 hours a day. It consists of an air-coagulation basin (ERDLator), diatomite filter, chemical feeder, pump, and 3-kW generator. Truck-mounted units have been used extensively in disaster-relief operations following floods, hurricanes, and earthquakes.

NADC aircraft and airborne infrared systems were used to detect water pollution in several local rivers under an experiment for EPA.

NOSC determined the environmental effects of siltation, dredging, sewage discharge, and ship movements on the communities of marine organisms in harbors.

NOSC determined the nutrient status of marine sediments and the impact of dredge spoils disposal.

NOSC is working on defining the possible radiological and biological implications following accidental marine deposition of radiological materials.

NOSC determined mercury content in marine sediments and in seawater in locations off the coast of Alaska.

An NOSC-developed underwater work system, the remotely controlled CURV III, was used to collect samples and make observations of the marine environment at dump sites.

NOSC determined the effects of certain marine environmental pollutants on pupping in California Sea Lions.

NOSC built and validated a portable Floating Breakwater to attenuate wave motions where protection is needed in fresh or sea water sites.

NOSC conducted aerial surveys to determine the population of bottle-nosed dolphins in the Mississippi Sound. They also worked with the Marine Mammal Commission and the National Marine Fisheries on ways to reduce porpoise kills in tuna fishing.

### Noise Pollution and Control

NOSC technical personnel are on the Noise Advisory Board for San Diego City, and on the San Diego County Noise Hearing Board. These boards review and make recommendations on noise ordinances. The county board also hears appeals on ordinance violations.

NOSC technical personnel headed the National Coordinating Council on environmental noise.

NOSC has worked with the National Institute of Health (NIH) on establishing standards for impact noises.

NOSC has conducted acoustic surveys at noisy locations, e.g., airports, engine test sites, etc., and aided in the design of noise suppression devices and techniques.

### General

Construction Engineering Research Laboratory has developed a computer-aided environmental impact assessment procedure for use in determining the impact of operations such as construction, operations and maintenance and industrial production. The system addresses physical, biological, and social-economic impacts as well as noise. CERL has provided specific recommendations in noise pollution, soil waste pollution and water pollution to specific Army installations in the continental United States.

Civil Engineering Laboratory is involved in developing hardware and techniques for use in the fight against pollution. CEL has discovered a method for treating oil spills.

## **GOVERNMENT INVENTIONS FOR LICENSING**

### **Mechanical Devices and Equipment**

Sandia Laboratories invites your non-exclusive licensed use of the following mechanical device. The rolamite principle is a combination or series of combinations of metal bands and rollers in hundreds of useful combinations. More than one hundred licenses have already been issued.

NADC has initiated a program to advertise and commercialize Navy technology through the licensing of patents.

## **INDUSTRIAL AND MECHANICAL ENGINEERING**

### **Tooling, Machinery, and Tools**

Sandia Laboratories has patented and developed an Interlocking Tape Joint as a means of joining cylindrical structural members such as large pipes, casings, rotary drill stems, canisters, and drums without the need for external flanges. The tape joint has been licensed since early 1976.

### **Manufacturing Processes and Materials Handling**

Sandia Laboratories has patented and developed a solder coating system for printed circuit boards which uses superheated air to level solder and remove excess solder from plated-through holes. The solder leveller is on the market, and licensees throughout the world have made their own equipment.

### **Nondestructive Testing**

Under Mobility Equipment Research and Development Command sponsorship, a Portable Gamma Ray Projector was developed by Technical Operations, Inc. The projector, which subsequently was marketed as a commercial product, contains an iridium isotope to generate radiation which easily passes through metal weldments exposing film placed on the far side. Once processed, the film reveals any defects within the weldment. This development has evolved into a number of commercial devices replacing much of the X-ray equipment once in common use for nondestructive inspection work.

In nondestructive testing CERL has developed the Kelly-Vail test for testing concrete in the plastic state, i.e. concrete while still in the mixing truck before placing in the form. CERL has also developed a weld-quality monitor which tests the quality of the weld while being placed. Many aspects of this technology were developed at Los Alamos Scientific Laboratory and are now used throughout the world.

## **LIBRARY AND INFORMATION SCIENCES**

### **Reference Materials**

Naval Ocean Systems Center library has acquired numerous hard-to-find articles for San Diego County Sheriff's Office.

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## **MATERIALS SCIENCES**

### **Coating, Colorants, and Finishes**

Civil Engineering Laboratory developed a simple kit for identifying the nature of weathered paints which is now being produced commercially.

NADC's experience in the development and application of powder coatings for corrosion and friction protection has assisted Bell Laboratories in the laying of telephone cables on the ocean floor. Special coatings for machine tools have been tested successfully to lengthen tool life.

### **Corrosion and Corrosion Inhibition**

Civil Engineering Laboratory has formulated new protective systems for structures exposed to corrosion.

### **Fibers and Textiles**

Army Natick Research and Development Command provided technical support and a transfer of technology to the U.S. Secret Service to supply their volume procurement of specialized body armor. This included Purchase Descriptions for Ballistic Kevlar Cloth, design and fabrication of prototypes and guide samples, patterns, test analysis of Kevlar prior to acceptance, inspection of cut ballistic fillers and final inspection of items.

The NYC Police Department and Baltimore Police Department were provided similar technical assistance and technology transfer to support their procurements of body armor.

The Prince Georges County Police Department received technical advice to support a pending procurement of a different type of Kevlar body armor item. New Purchase Description and prototype guide samples were provided. Technical support to provide patterns, examine pre-awarded items, and conduct inspections during the course of their contract is planned for FY 77.

Technical advice was also furnished to the Seattle, Washington, and State of Washington Police Departments in support of their body armor procurements.

The Baltimore Police Department was provided a prototype women's body armor and requested technical assistance to measure personnel, and design and develop an acceptable Women's Ballistic Undergarment to include preparation of a full set of patterns to fit their female population. This technical support and technology transfer work was provided during FY 77.

A major effort was conducted for the Drug Enforcement Administration for the design, development and procurement of a large quantity of specialized Ballistic Undergarments for personal and tactical protection and for a specialized "Raid Jacket" providing 9 mm protection.

Extensive support is being provided to the FBI for the design, development and procurement of a large quantity of specialized 9 mm protective undergarments.

Project Officers and Procurement Personnel of the NYC Police Department, Baltimore Police Department, Prince Georges County Police Department, Secret Service, Drug Enforcement Administration, and FBI received educational training on the technical aspects, test analysis of material and methods for conducting quality control inspections.

### Materials Degradation and Fouling

Forest Service has techniques for prevention and control of wood decay and termite problems.

### Miscellaneous Materials

Construction Engineering Research Laboratory has developed numerous studies on the characteristics of materials commonly used in building construction. In addition, CERL has developed an economic forecaster on the cost of corrosion for a military installation.

### Solvents, Cleaners, and Abrasives

Sandia Laboratories has patented and released a process for the preparation of odorless formaldehyde for use as a sporicide and/or disinfectant where normal formaldehyde is objectionable because of its odor. It is available on a non-exclusive licensing basis.

### Wood and Paper Products

A fabric paper sandbag, knitted and woven, was developed by the Mobility Equipment R&D Command as an alternative to the cotton and jute burlap sandbag. These paper sandbags contained an organo-zinc fungicide, proved immune to termite attack and exhibited useful military service life. Civilian applications for these bags are many. They were used, for instance, by Mississippi and Louisiana for flood control. The excellent resistance of these bags to termite attack indicates that this technology may provide civilian wooden structures of all kinds with the same long-term projection.

### General

The development of induction-heating techniques at Los Alamos Scientific Laboratory for high-temperature metals and alloys spawned a whole industry.

FBI Laboratory applies scientific methods and techniques to the comparison examination of evidentiary materials related to criminal matters. This includes general areas of chemistry, drugs, firearms, toolmarks, explosives, physics, metallurgy, biochemistry, documents and related areas. These comparisons/examinations are conducted free of charge for all Federal agencies, U.S. Attorneys, military tribunals, and duly constituted state, county, and municipal law enforcement agencies in the U.S.

## **MATHEMATICAL SCIENCES**

### Operations Research

Naval Ocean Systems Center personnel from OR group have assisted the San Diego Police Department in establishing computer needs and consultant requirements on a large regional criminal justice computer system.

## **MEDICINE AND BIOLOGY**

### **Surgery**

Los Alamos Scientific Laboratory, in cooperation with the University of New Mexico Medical School, developed electrosurgical coagulating-cutting forceps.

### **Toxicology**

The Chemical Systems Laboratory has developed a treatment for nerve gas poisoning which has application as a therapy for poisoning by parathion and other anticholinesterase compounds.

### **Botany**

Forest Service Research has a complete program for the detection and care of tree wounds which is used by arborists, city foresters, and nurserymen.

## **NATURAL RESOURCES AND EARTH SCIENCES**

### **Natural Resource Surveys**

Lewis Research Center utilized airborne multispectral scanning methods to monitor strip mine area surface conditions and water pollution for the State of Ohio.

### **General**

Construction Engineering Research Laboratory has developed a procedure for utilizing ERTS in developing a baseline of an ecology on a military installation for use in environmental impact assessment procedures.

## **NAVIGATION, GUIDANCE AND CONTROL**

Airborne collision avoidance systems have been developed by NADC and tested for military and commercial aircraft in conjunction with FAA.

## **NUCLEAR SCIENCE AND TECHNOLOGY**

### **General**

BNL detects radiation with semiconductor, liquid, and gaseous detectors. Computer control and data acquisition of experiments. Medical applications of nuclear technology. Operation of the High Flux Beam Reactor and the Medical Research Reactor.

## **OCEAN TECHNOLOGY AND ENGINEERING**

### **Underwater Construction and Habitats**

In the ocean engineering field, the Civil Engineering Laboratory has conducted extensive studies revolving around the use of concrete in the sea. The construction and implantment of the 50-ton,



unmanned SEACON structure at a 600 foot depth in the Santa Barbara Channel, which incorporated a number of significant experiments, considerably advanced the technology of seafloor construction. The use of plastic materials to fabricate a two-man capsule capable of descending to 600-feet in the ocean and providing 360 degrees visibility was demonstrated in the CEL-designed NEMO. In other ocean related projects the Laboratory has developed propellant driven anchors, pontoon lift systems for salvage work, diver heating systems and undersea diver tools. For undersea construction work, CEL participated in the development of the Buoyancy Transport Vehicle, which can function as a sea-going forklift, and the Construction Assistance Vehicle, virtually a diver-operated pickup truck.

NOSC used CURV III underwater vehicle to

- a. Rescue disabled manned submersible
- b. Inspect a Great Lakes Ore Carrier which had broken in two and sank in Lake Superior
- c. Retrieve objects lost at sea.

Also, NOSC built and certified an inflatable recompression chamber for emergency use.

## **PHYSICS**

### **Structural Mechanics**

Construction Engineering Research Laboratory has the world's largest shock and vibration test machine. This machine can accommodate a load of 15 tons, accelerate it vertically to 40 g's and horizontally to 20 g's. The shake table has been used to evaluate the capacity of structures in seismic areas and in blast load areas. The structures test varied in size from small residence to large mechanical and electrical devices for nuclear power plants which were tested in their operational mode.

## **PROBLEM SOLVING INFORMATION FOR STATE AND LOCAL GOVERNMENTS**

### **Police, Fire, and Emergency Services**

Chemical Systems Laboratory produced data and studies for the development of soft body armor for police and other agencies, developed standards for hand held aerosol tear gas weapons for riot control, and developed suppressive-shielding technology for use in designing "bomb rovers" for bomb disposal squads of municipal police departments.

Lewis Research Center designed and built an inexpensive portable fire hose tester, the design of which has been provided to numerous city fire departments and manufacturers.

The Naval Underwater Systems Center has participated in a project with the New York City Police Department for the design and development of an asset management system. The system, based on NUSC's instrumentation control and plant account programs, has been operational on the New York City Police Department computer system since September 1976

An IPA assignment has been made to the New York City Police Department by NUSC. The technology agent on assignment will analyze the department's fuel dispensing system and evaluate the cost/benefit potential of automating, semiautomating and revising existing manual procedures as they relate to dispensing vehicle fuel.

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The Naval Underwater Systems Center has provided communications consultation services for development of an Emergency Medical System (EMS) plan for South Central Connecticut. The EMS communications system is now operational.

An electronics engineer from the Naval Underwater Systems Center has worked with SEARCH GROUP, Inc. to examine the possibility of applying underwater communications techniques as a solution to problems posed by the bandwidth of public safety channels. Surveys of police departments have shown a definite and increasing need for speech scramblers. Technical surveys have shown that no presently available speech scramblers meet the criteria for privacy, performance and cost. As a result, a recommendation is being made to LEAA to fund a two-year program to develop a new type of scrambler that shows good potential for increased privacy and lower system cost.

Several studies have been conducted and are continuing at the Naval Underwater Systems Center under the provisions of the Intergovernmental Cooperation Act to determine adequate means by which the town of Waterford, CT can comply with federal requirements for civil preparedness.

The Naval Ocean Systems Command assisted the Poway, California fire department that had difficulties in communication from the station to vehicles due to terrain constraints. Using radiowave propagation technologies, NOSC scientists solved the problem by recommending repeated sites situated on hilltops around the city.

The Forest Fire Laboratory has developed interagency communications systems, equipment, and techniques for use with city, county, state, and federal agencies. Also, mobile communication center and remote site communication techniques.

The Boise Interagency Fire Center has a variety of equipment capabilities, and expertise used in wildland fire management (or other emergencies), including remote field communications, infrared systems, specialized equipment, logistics, etc.

FBI Laboratory has established research programs in forensic science areas resulting in:

1. Publication and dissemination of research results in scientific journals.
2. Presentation of research data at seminars, academic settings and forensic science meetings.
3. Publication of Crime Laboratory Digest with pertinent information distributed to local law enforcement agencies.

The FBI Laboratory conducts specialized schools at no cost for approximately 600 laboratory scientists each year. Schools are conducted at FBI Academy, Quantico, Virginia, and include general areas of scientific instrumentation, chemistry, biochemistry, and various pertinent materials sciences. Schools are designed to train police laboratory scientists in basic forensic methods/equipment and to enhance their skills and competency in individual areas of expertise.

### Education

A working, dynamic model of the vocational education system of the State of Rhode Island has been developed by the Naval Underwater Systems Center to develop a unified state-wide policy for vocational education. Publication of this model as a technical document has spawned considerable interest in this program in other parts of the country.

## Energy

Lewis Research Center utilized airborne multispectral scanning methods to monitor buildings and other ground facilities for places of excessive heat loss, including, for HUD, selected residential areas in Cleveland, Ohio, and Springfield, Illinois.

Los Alamos Scientific Laboratory performed a cost-benefit analysis for the State of New Mexico on proposed State construction of an intrastate gas pipeline.

## Environment

The Federal Highway Administration recently published a two-volume state-of-the-art report to give highway officials and wildlife biologists the latest information on the impact of highways on wildlife populations and their habitats.

## Transportation

The Federal Highway Administration developed and made ready for testing, control logic to enable systematic distribution of traffic throughout a complex corridor of parallel and interconnecting highways.

The Naval Underwater Systems Center has assisted the Urban Mass Transportation Administration (UMTA) Office of Technology Development and Deployment in research to evaluate life cycle costing (a DoD-developed technique to facilitate the identification and definition of all costs associated with each phase of a project) and the extent to which it can be utilized in urban mass transit systems.

## General

Recently the Naval Underwater Systems Center has expanded its Technology Transfer Program by utilizing the mobility provisions of the Intergovernmental Personnel Act of 1970 to facilitate assignment of employees to directly assist State and local government. To date, 10 assignments have been made in the following areas: Connecticut Conference of Municipalities; Connecticut Department of Planning and Energy Policy; Rhode Island League of Cities and Towns; Rhode Island Energy Office; New York City Police Department; Mayor's Office, Kettering, Ohio; CTIP agent, Vancouver, Washington; CTIP agent, East Providence, Rhode Island; Connecticut Legislative Research Staff; and Rhode Island Department of Community Affairs.

## **TRANSPORTATION**

### Road Transportation

Lewis Research Center, for DOE, is developing the technology for practical electric automotive vehicles, including the continuing evaluation of commercial electric vehicles. Additionally, LeRC, for DOE, is developing the technology for practical gas turbine automotive vehicles engines.

## General

Los Alamos Scientific Laboratory has worked on bomb- and explosion-containment vessel design for the FAA and other agencies.

## **URBAN AND REGIONAL TECHNOLOGY AND DEVELOPMENT**

### Fire Services, Law Enforcement, and Criminal Justice

Under ERDA's Technology Utilization Program, Lawrence Livermore Laboratory is helping the San Diego Police Department explore the usefulness of automated crime analysis by using computers to do pattern recognition. LLL demonstrated an experimental system and is assisting the San Diego police in the transition from the experimental system to an operational one. Tests have shown the system will be a time-saving, cost-effective tool for allowing the Police Department's available manpower to more effectively solve and prevent crimes.

Recent developments in fire fighting technology were demonstrated at a one day workshop meeting of the Fire Officers and Fire Fighters of the Fourth Naval District and local volunteer fire companies held at NADC. The meeting included presentations of NOMEX fire protection clothing, helmets, communications, infrared heat detecting equipment, helo rescue nets and lightweight oxygen systems. The majority of the items presented were spinoffs from Navy and NASA technical development programs.

NADC personnel served as technical advisors with the Philadelphia Mayor's Science and Technology Advisory Council and Pennsylvania Technical Assistance Program (PENNTAP).

### Recreation

Los Alamos Scientific Laboratory used a rock-melting penetrator (Subterrene), for the National Park Service, to make drainage holes in a fragile archeological site.

## General

The Night Vision Laboratory participated in numerous activities resulting in a continuous transfer of technology to the government and private sectors. Technology transfer activities have ranged from general briefings, demonstrations, technical assistance to loans of unique and specialized night vision equipment. Medical establishments, law enforcement agencies, universities, government and industrial research firms have sought guidance as to the application of night devices for the solution of their particular problems. Such night vision systems as the Handheld Thermal Viewer, Night Vision Goggles, Airborne Forward Looking Infrared Sensor, Handheld Searchlight, Starlight Scope and Night Observation Device were used in applications for night blindness, beach patrol, narcotics traffic, burglaries, forest fire detection, law enforcement, low income housing winterization, star guiding and astronomy and aircraft safety. Investigators also used night vision devices in the biological and behavioral aspects of the white tail deer, Haitian Hutia, sea turtle, rodent, chimpanzee, Greenburg and Pecan weevil and bird mortalities caused by atomic power plant construction.

## **STATE AND LOCAL GOVERNMENT PROGRAMS AT NUSC**

The Naval Underwater Systems Center is continuing its active participation in efforts to expand the delivery of technology to state and local governments. NUSC is serving as a technology resource

for the 27-city Urban Technology System. In that capacity, assistance is being provided to medium-size cities across the country. In addition, the New England Innovation Group is being aided in its efforts to develop a regional technology transfer program utilizing Federal laboratories, universities and the private sector to help solve problems at the state and local level.

A major expansion of the local government program has been achieved by utilizing the mobility provisions of the Intergovernmental Personnel Act (IPA) of 1970 to facilitate assignment of employees to directly assist state and local government. In November 1976, Robert B. MacDonald, a physicist at NUSC began a full time assignment as a technology transfer agent with the Connecticut Conference of Municipalities (CCM). This was the first time a NUSC staff member was assigned under the mobility provisions of the IPA.

Mr. MacDonald, whose assignment is partially sponsored by the New England Innovation Group, which is funded by the Division of Intergovernmental Science and Public Technology of the National Science Foundation (NSF), serves as a link between the public sector needs of the 169 towns in Connecticut and the technology resources that can meet those needs. For example, in the past 10 months, Mr. MacDonald has handled over 100 requests for assistance from local governments in such diverse areas as chemical analysis, cost evaluation, aerial photography, photography equipment, snow and ice control, records management, energy conservation, ultrasonic level detectors, soil mechanics, infrared scans, and reference materials.

One of Mr. MacDonald's major accomplishments has been the coordination of workshops for municipal officials. To date, three workshops have been held featuring speakers on police technology, energy conservation, and solid waste management.

Field tests of a computer program designed to improve snow removal techniques are currently being conducted through the technology agent at CCM. This program is a unique example of technology transfer to local governments because it involves the cooperation of several levels of government. Sponsored by NSF funding, technical personnel from both the Army Cold Regions Research and Engineering Laboratory and NUSC are working closely with representatives of 21 universities in Connecticut to examine and attempt to optimize snow removal and routing systems. Thirty-two municipalities in Connecticut have already expressed an interest in the program and the first phase of the project, data collection, has been initiated in these towns.

Gordon Preiss, a mechanical engineer at NUSC, is assisting the State of Connecticut Department of Planning and Energy Policy in the fields of solar energy and energy conservation. To encourage citizens to utilize alternative energy sources, Mr. Preiss is coordinating the installation of a solar energy hot water heating system at the governor's residence in Hartford, and has conducted workshops on energy conservation and use of solar energy for private citizens. He also assisted the New England Regional Commission in the formulation of a solar energy information center and a hot water initiative program with HUD.

William J. McGrath, a computer systems analyst at NUSC, is on assignment to the New York City Police Department Motor Transport Division to analyze the department's fuel dispensing system and evaluate the cost/benefit potential of automating, semi-automating, and revising existing manual procedures related to the dispensing of vehicle fuel. Phase I of the project, a study of the system currently in use, has been completed and a cost evaluation of an automated, on-line fuel dispensing system is being conducted in preparatory system implementation.

Vincent A. Mannion, a civil engineer from NUSC, has been detailed to the Rhode Island League of Cities and Towns (RILCT) to coordinate the efforts of the New England Innovation Group, Massachusetts League of Cities and Towns, and RILCT in introducing the Navy's building maintenance technology to local governments of Southern New England. Also, Mr. Mannion has been providing assistance to state and local governments in areas such as energy, water leakage, and emergency communication systems and equipment.

Ronald G. Heroux has been assigned as Executive Director of the Miami Valley (Ohio) Cable Television Council. He will serve as advisor to the Council and the Council's Board of Trustees and Government Technology Committee in their efforts to coordinate governmental, educational and community activities among the six cities in the Miami Valley, and to obtain grants leading to improved intercity cooperation via use of the cable television system, which includes a separate 38-channel two-way institutional cable connecting the city buildings, schools, hospitals, libraries and other public institutions. The system will provide an opportunity for intergovernmental service delivery activities such as computer services, coordinated fire and police training, and labor negotiation information in order to eliminate duplication and save money.

Ms. Margaret M. McNamara, a research and administrative associate for the New York State Assembly Scientific Staff in Albany, New York, has been assigned to the Office of Special Programs Development at NUSC. This represents the first time an assignment of this type has been made at NUSC.

Ms. McNamara serves as the assistant for state and local government programs under the NUSC Technology Transfer program. Her duties include conducting experiments to study the effectiveness of existing intergovernmental projects at NUSC and techniques utilized for implementing additional projects.

Another IPA assignment from NUSC is in the final phase of negotiation. This assignment will place a technology transfer agent under the Urban Technology System in the city of Springfield, MA.